

Abdeljalil Ihmed Elsageer Ahmed

THE EXTENT OF FARM CREDIT IN THE LIBYAN AGRICULTURAL SECTOR



Cuvillier Verlag Göttingen
Internationaler wissenschaftlicher Fachverlag

THE EXTENT OF FARM CREDIT IN THE LIBYAN AGRICULTURAL SECTOR

I n a u g u r a l - D i s s e r t a t i o n

zur

Erlangung des Grades

**Docktor der Agrarwissenschaften
(Dr. Agr.)**

der

Hohen Landwirtschaftlichen Fakultät

der

Rheinischen Friedrich-Wilhelms-Universität

zu Bonn

vorgelegt am 31.May. 2010

von

Herrn Abdeljalil Ahmed

aus

Surt, Libya

Bibliografische Information der Deutschen Nationalbibliothek

Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über <http://dnb.d-nb.de> abrufbar.

1. Aufl. - Göttingen : Cuvillier, 2010

Zugl.: Bonn, Univ., Diss., 2010

978-3-86955-422-8

Referent Prof. Dr. Klaus Froberg

Korreferent Prof. Dr. Thomas Heckelei

Tag der mündlichen Prüfung 22. 07. 2010.

Angefertigt mit Genehmigung der Hohen Landwirtschaftlichen Fakultät der Rheinischen Friedrich-Wilhelms-Universität Bonn

© CUVILLIER VERLAG, Göttingen 2010

Nonnenstieg 8, 37075 Göttingen

Telefon: 0551-54724-0

Telefax: 0551-54724-21

www.cuvillier.de

Alle Rechte vorbehalten. Ohne ausdrückliche Genehmigung des Verlages ist es nicht gestattet, das Buch oder Teile daraus auf fotomechanischem Weg (Fotokopie, Mikrokopie) zu vervielfältigen.

1. Auflage, 2010

Gedruckt auf säurefreiem Papier

978-3-86955-422-8

ABSTRACT

Rural households in Libya are credit constrained, in terms of access and the amount of credit received. Formal banks are the main players in credit market. Despite 44 branches of agricultural banks distributed countrywide, these branches offer a limited number of credit for different purposes every year. The shares of these branches in rural credit market are quite small: agricultural banks provide only 24 % of loans and the other banks, mainly the commercial banks, provide 76 % of loans. However, agricultural credits provided by agricultural banks offer the most favorable terms for those households that have a positive demand on agricultural credit. Households that have no access to agricultural credits on the other hand face the problem of paying a higher interest rate when applying for credit from non-agricultural banks. This study is an investigation on 'the importance of large credits in Libyan rural-areas, and the main players in the rural-credit market'. This study determines factors affecting access and credit applications in three different locations. In addition, the affect of households, land, and socio-economic characteristics are analyzed using econometric analysis based on primary data collected during field research in the years 2006 and 2007. Empirical results from the data collected from three different regions in Libya confirm that more than half of rural households have no access to credit and around 42% of rural households do not want to participate in loan borrowing or take loans from any financial institutions that charge high interest rate. This is mostly due to religious considerations that prohibit 'unethical' interest rates charged by banks. The results clearly indicate that more than 51.85% of the loans taken by households are used to build houses, 33.3% of the loans are used in production inputs, and 9.8% of loans are used for family needs and the remaining 4.9% of loans are used for social events respectively. Research findings indicate that 'socio-economic characteristics' of heads of households are important factors increasing the probability of access to credit. Households headed by married men have a higher probability of access to credit compared to households headed by females or bachelors and unmarried women. Heads of households with some years in schooling and a permanent monthly income from off-farm activity have a higher probability of access to credits than other heads who have less education or have no permanent income. Different forms of credit constraints are discussed and comparisons between selected samples are drawn in order to classify constrained and unconstrained households.

ZUSAMMENFASSUNG

Ländliche Haushalte in Libyen leiden unter Kreditrationierung sowohl was den Zugang zu als auch was die Höhe von Krediten betrifft. Die Hauptakteure im Kreditwesen sind formelle Banken. Obwohl es, über das ganze Land verteilt, 44 Niederlassungen von Agrarbanken gibt, können diese jährlich nur eine begrenzte Anzahl an Krediten vergeben, denn die Anteile dieser Niederlassungen am Kreditmarkt sind klein. Sie vergeben nur 24% der Darlehen, die restlichen 76% der Darlehen werden von anderen Banken – hauptsächlich von Geschäftsbanken – vergeben. Von Agrarbanken vergebene Kredite bieten ländlichen Haushalten die besten Bedingungen. Haushalte, die keinen Zugang zu Krediten von Agrarbanken haben, müssen mit höheren Zinssätzen rechnen, wenn sie bei anderen Banken Kredite beantragen. In der vorliegenden Arbeit werden die Bedeutung von Krediten und deren Höhe in ländlichen Gebieten Libyens untersucht sowie die wichtigsten Akteure im ländlichen Kreditmarkt Libyens aufgezeigt. Dazu werden Faktoren bestimmt, die Einfluss auf den Zugang zu und die Beantragung von Krediten haben. Die erhobenen Daten stammen aus drei unterschiedlichen Regionen Libyens. Darüber hinaus wird die Bedeutung von Haushaltstruktur, Landbesitz und weiterer sozioökonomischer Faktoren für den Zugang zu Krediten untersucht. Dazu wird die Ökonometrische-Analyse, basierend auf Primärdaten, die während der Feldforschung 2006/ 2007 erhoben wurden, angewandt. Empirische Ergebnisse aus den Daten, die in den drei unterschiedlichen Regionen Libyens aufgenommen wurden, bestätigen, dass mehr als die Hälfte der ländlichen Haushalte keinen Zugang zu Krediten haben. Rund 42% der ländlichen Haushalte lehnen es aus religiösen Gründen ab, Kredite von Banken anzunehmen, da Zinseinnahmen sowie Zinszahlungen religiösen Vorstellungen zufolge verboten sind. Die Ergebnisse zeigen, dass mehr als 51,85% der an ländliche Haushalte vergebenen Kredite für familiäre oder soziale Zwecke genutzt werden. Weiterhin zeigen die Ergebnisse, dass sozioökonomische Faktoren, wie etwa die Haushaltsstruktur, erheblichen Einfluss auf die Wahrscheinlichkeit haben, Zugang zu Krediten zu erhalten. So zeigen männlich geführte Haushalte mit verheirateten Haushaltsvorständen eine erheblich größere Wahrscheinlichkeit, Zugang zu Krediten zu bekommen, als weiblich geführte Haushalte oder von Ledigen geführte Haushalt. Ausgebildete Haushaltsvorstände mit einem regelmäßigen monatlichen Einkommen aus einer außerhalb des landwirtschaftlichen Sektors liegenden Erwerbstätigkeit weisen eine höhere Wahrscheinlichkeit auf, Zugang zu Krediten zu erhalten, als Haushalte ohne regelmäßiges Einkommen oder Ausbildung. Weiterhin werden verschiedene Formen von Kreditrationierungen besprochen und vergleiche zwischen ausgewählten Beispielen gezogen, um benachteiligte und nicht benachteiligte Haushalte genauer definieren zu können.

ACKNOWLEDGMENTS

I would like to express my sincere gratitude to my first supervisor, Professor. Dr.Klaus Frohberg, for helping me chooses my topic of research and also for his generous support and patience during my years of graduate studies at ZEF-University of Bonn. Beyond matters of research, his wisdom and kindness have had a positive influence on my life. I am extremely fortunate to have him as my advisor. I also extend my thanks to my second supervisor, Professor.Dr.Thomas Heckelei, for his important suggestions and valuable comments. I am also greatly indebted to the University of Bonn for offering excellent courses in Econometrics at the Institute of Food and Resource Economics.

In addition, I am grateful to have had the opportunity to interact closely with Dr. Holger Seben and also for his valuable comments and suggestion in econometric part, and for his great support in using STATA program. My thanks are also extended to the ZEF staff for teaching me the courses at ZEF. I also extend my great thanks to the entire ZEF administration and especially to Dr. Manske, Mrs. Zabel and also the students' assistance during my graduate studies in Bonn. I make a note of appreciation to all my colleagues at the Department of Economic and Technological Changes in ZEF.

My sincere thanks goes to The Libyan Ministry of Higher Education for providing me the financial support to pursue research abroad, and many thanks also to Altahadi University in Surt for encouraging me to take up this research project. A note of appreciation is also made to all the students who participated in Rural Household Survey during the field research period when I was in Libya and also to the staff of The Faculty of Agricultural Science at Altahadi University for their assistance. My special thanks to Mr. Srinivas Chakravarthy, Faculty of English, Altahadi University for proof reading and correcting the English content.

Finally, by no means the least, I sincerely appreciate the support and understanding and offered by my family, specially my wife Fathiya Elmahtout, my wonderful daughters Aalla, Line and my son Mohammed, and the whole family in Libya, without whose

constant support, infinite love, encouragement, and continues prayers and care throughout my life this work would not have been possible.

Bonn, Germany-2010

TABLE OF CONTENTS

ABSTRACT	I
ZUSAMMENFASSUNG	II
ACKNOWLEDGMENTS	III
LIST OF FIGURES	VIII
LIST OF GRAPHS	IX
LIST OF TABLES	IX
ACRONYMS AND ABBREVIATIONS	X
1. INTRODUCTION	1
1.1 MOTIVATION	1
1.1.1 Agricultural sector in the Libyan economy	2
1.1.2 Libyan labor force issues	4
1.1.3 Finance sector development and soundness	7
1.2 OBJECTIVES AND RESEARCH QUESTIONS	11
1.3 OUTLINE OF THE THESIS	12
2. CREDIT INFRASTRUCTURE AND ECONOMIC THEORY	13
2.1 THE THEORY OF INVESTMENT	13
2.1.1 The production possibility set	13
2.1.2 Maximizing profits	14
2.1.3 The investment demand curve	17
2.2 CREDIT AND ECONOMIC GROWTH	20
2.2.1 Impact of credit on investment	21
2.2.2 Impact of credit on choice of technology and employment	22
2.2.3 Impact of credit on poverty reduction	24
2.3 FINANCIAL PERFORMANCE AND SUSTAINABILITY	27
2.3.1 How financial markets create value	27
2.3.2 The management of financial institutions for the poor	29
2.4 CREDIT CHANNEL IN THE FINANCIAL INSTITUTIONS	33
2.4.1 Financial institutions	33
2.4.2 Credit and transaction costs	34
2.5 IMPERFECT INFORMATION IN CREDIT MARKETS	37
2.5.1 Adverse selection	38
2.5.2 Moral hazard	44
2.5.3 Monitoring cost	46
3 LITERATURE SURVEY	49
3.1 ACCESS TO THE CREDIT MARKETS	50
3.2 CREDIT CONSTRAINTS	51
3.3 MEASURING ACCESS TO CREDIT AND CREDIT CONSTRAINTS	52
3.3.1 Indirect method	52
3.3.2 Direct method	53

3.4	FACTORS AFFECTING ACCESS TO CREDIT AND CREDIT APPLICATIONS	54
3.4.1	Attribute of financial institutions.....	54
3.4.2	Household characteristics and demand for credit.....	56
4.	DATA AND METHODS.....	59
4.1	STUDY METHODS	59
4.2	SAMPLING DESIGN	63
4.3	RESEARCH LOCATIONS	66
5.	EMERGING PATTERNS IN THE RURAL CREDIT MARKET	68
5.1	ACCESS TO CREDIT AMONG REGIONS	68
5.2	CREDIT APPLICATIONS.....	71
5.3	AMOUNT OF CREDIT RECEIVED.....	73
5.4	HOUSEHOLD CREDIT CONSTRAINT.....	75
5.5	THE ROLE OF FORMAL BANKS IN CREDIT MARKET	78
5.6	GOVERNMENT CREDIT POLICIES	80
6.	DETERMINANTS OF ACCESS TO CREDIT.....	81
6.1	MODEL ESTIMATION	81
6.1.1	Probit model	82
6.1.2	Computing the marginal effects.....	84
6.2	DISCUSSION OF MODEL RESULTS	86
6.2.1	Household's socio-economic characteristics and impact of the ability of access to credit .	86
6.2.2	Farm characteristics and the impact on the ability of access to credit.....	88
6.2.3	The impacts of livestock holding and household assets on access to credit.....	90
6.3	SUMMARY.....	91
7.	DETERMINANTS OF CREDIT APPLICATIONS	92
7.1	MODEL ESTIMATION	92
7.2	DISCUSSION OF THE MODEL RESULTS.....	96
7.2.1	Household's socio-economic characteristics and credit applications.....	96
7.2.2	The impact of farm characteristics on credit applications	98
7.2.3	The impacts of livestock holding and households' assets on credit applications.....	100
7.3	SUMMARY.....	102
8	AMOUNT OF CREDIT RECEIVED DETERMINATION	103
8.1	MODEL ESTIMATION	103
8.2	MODEL RESULTS.....	104
8.2.1	The impacts of interest rate on amount of credit received.....	105
8.2.2	Repayment period and the impacts on amount of credit	107
8.3	SUMMARY.....	109
9.	DETERMINANTS OF CREDIT CONSTRAINTS	110
9.1	MODEL ESTIMATION	110
9.2	MODEL RESULTS.....	112
9.2.1	Probability of households which applied for credit facing credit constraints.....	113
9.2.2	Probability of households which received credit but face a credit constraints	116
9.3	SUMMARY.....	118
10	CONCLUSION AND POLICY RECOMMENDATION	119

10.1	INTRODUCTION	119
10.2	ACCESS TO CREDIT.....	119
10.3	CREDIT APPLICATIONS.....	120
10.4	AMOUNT OF CREDIT RECEIVED AMONG HOUSEHOLDS	120
10.5	HOUSEHOLDS CREDIT CONSTRAINTS	121
10.6	POLICY RECOMMENDATION.....	121
	BIBLIOGRAPHY	122
	APPENDIX	131
	LIST OF VARIABLES AND UNIT OF MEASUREMENTS	131
	RURAL HOUSEHOLD SURVEY	133

LIST OF FIGURES

Figure 1-1: The shares of the agricultural sector in the total Libyan GDP.....	3
Figure 1-2: Total labor force distributed by sectors.	5
Figure 1-3: Total loans distributed by agricultural banks 1997-2003.	8
Figure 4-1: Conceptual framework	62
Figure 4-2: Map illustrates locations of agricultural banks and research areas.....	67
Figure 5-1: The distribution of number of households with and without access to credit (in number of households).....	68
Figure 5-2: Access to credit distributed by head of households' gender (in %).....	69
Figure 5-3: Access to credit distributed by livestock holding (in %).	70
Figure 5-4: Households assets distributed by access to credit (in LYD).....	70
Figure 5-5: Number of households that applied and did apply for credit (in number of households)	71
Figure 5-6: Livestock holding among farm households as regards to credit applications (in %). 72	72
Figure 5-7: Amount of assets of farm households as regards to credit applications (in 1000 LYD).	72
Figure 5-8: Number of households with accepted and denied credit applications (in number of households).	74
Figure 5-9: Average amount of credit received among regions (in LYD).	74
Figure 5-10: Shares of credit granted by the formal lenders in the three selected regions.....	78
Figure 6-1: Probability of access to credit distributed by head of households.	87
Figure 6-2: Probability of access to credit distributed by head of household's marital status.	87
Figure 6-3: Probability of access to credit distributed by types of water sources.	89
Figure 8-1: Interest rates charged by agricultural and non-agricultural banks.	107
Figure 9-1: The impact of livestock holding on the probability of being access constrained.	113
Figure 9-2 : The impact of household assets on the probability of being access constrained.	114
Figure 9-3: The impact household's income on the probability of being access constrained.	115
Figure 9-4: The marginal effects of household assets on the probability of becoming credit amount constrained	116
Figure 9-5: The marginal effects of household income from off-farm activities on the probability of becoming credit amount constrained	117

LIST OF GRAPHS

Graph 2-1: The inter-temporal production possibilities set.....	14
Graph 2-2: The decision that be made by profit maximization firm.	16
Graph 2-3: Deriving the investment demand curve.....	18
Graph 2-4: The equilibrium of rate of interest in the classical theory.....	19
Graph 2-5: Demand for credit in the relation to interest rate and lending cost.	21
Graph 2-6: Inter-linkage between credit market and choice of technology.	23
Graph 2-7: Inter-linkage between credit market, choice of technology and income.....	25
Graph 2-8: Poverty reduction as conceptualized by income-poverty-approach.....	26
Graph 2-9: The supply and demand of credit with transaction costs.	34
Graph 2-10: Interest rate and expected return.	35
Graph 2-11: Credit supply perfectly elastic.....	39
Graph 2-12: Firm profits are convex function of the return on the project.	42
Graph 2-13: Expected loan profit with adverse selection.....	43
Graph 2-14: Monitoring cost and efficient debt contract.	48

LIST OF TABLES

Table 1-1: The distribution of employment by economic activities in 2003.....	5
Table 5-1: Differences in socio-economic characteristics of credit access constrained and unconstrained households.	76
Table 5-2: Social-economics characteristics' of credit received constrained and unconstrained households.....	77
Table 6-1: Factors determining the ability of access to credit.....	83
Table 6-2: Marginal effects of factors determinant access to credit.....	85
Table 7-1: Factors determining credit applications.	94
Table 7-2: Marginal effects of factors determinant credit applications.....	95
Table 8-1: Factors determining the amount of credit received.....	105
Table 9-1: Factors determining the probability of households which applied for credit of being access constrained.	112
Table 9-2: Factors determining the probability of households which received credit of being credit constrained	112

ACRONYMS AND ABBREVIATIONS

ABs:	Agricultural Banks
ABBs:	Agricultural Bank Branches
ACB:	Agricultural Central Bank
ADB:	Agricultural Development Banks
CBs:	Commercial Banks
CDF:	Cumulative Distribution Function
FAO:	Food and Agricultural Organization of the United Nations
GBB:	Grameen Bank of Bangladesh
GDP:	Gross Domestic Product
IMF:	International Monetary Fund
LCB:	Libyan Center Bank
LCPIH:	Life-Cycle Permanent Income Hypothesis
LDCs:	Less Developed Countries
LMF:	Libyan Ministry of Finance
LMLT:	Libyan Ministry of Labor and Training
LYD:	Libyan Dinars'
MMRP:	Man-Made River Project
μ :	Mean (Statistical mean)
NABs:	Non-Agricultural Banks
NGOs:	Non-Governmental Organizations
PNB:	Paribas Banks
QRM:	Qualitative Response Model
RBs:	Rural Banks
RHS:	Rural-Households Survey
WB:	World Bank
US\$:	American (United States) Dollar
ZEF:	Zentrum Für Entwicklungsforschung

Chapter 1

1. INTRODUCTION

1.1 MOTIVATION

The central tenet of institutional economics is that a modern economy is a complex, evolving system whose effectiveness shows in meeting diverse and changing human purposes. Observers of economic growth in Less Developed Countries (LDCs) and new industrial countries found that important and essential dimensions of the problem of economic development, in particular institutional development to achieve freedom, economic prosperity and security. One of the most important government organizations are financial one, because of their role play in rural credit markets. There a more general question. Are rural areas sufficiently equipped with institutions?

The majority of formal lenders in LDCs are not well educated for the job, highly inefficient due to technical and management problems, particularly agricultural finance organizations. Adams, et.al, (1984); Braverman, et.al, (1984) and Adam, et.al, (1985) have reported that the varieties of these organizations particularly the so called Agricultural Banks (ABs), Agricultural Development Banks (ADBs) and Rural Banks (RBs) are established to provide credit at subsidized interest rates, these banks have failed to achieve their objectives to serve the rural poor and establish themselves as sustainable credit organizations. Empirical studies of rural credit markets discovered that the variety of these banks are characterized by high lending costs, resulting from high credit demand and high interest rates being charged by these banks. Other financial organizations such as the traditional Commercial Banks (CBs) have no motivation to lend to poor households in the rural areas, due to the lack of feasible collaterals and high risks of lending and the problems of repayment.

However, a number of recent papers provide empirical evidence that confirms the importance of financial intermediaries' quality for economic growth performance. Financial intermediaries perform important function in development process.

Increase in the availability of the financial instruments' for instance reduces transaction and information costs. Reducing the transaction costs¹ and offering more information² by lenders to borrowers will lead to increase in the borrowing rates among households that will increase the investment in rural areas and therefore economic growth. Understanding the function of financial organizations throughout the credit market gives policy-makers and financial intuitions knowledge of why some organizations have succeeded and others have failed in serving the poor in rural areas. Understanding the factors that have impact on credit market, which include formal lenders' characteristics that are mainly related to loans' contracts or other characteristics that are related to borrowers are also important for understating the functioning of financial organizations, particularly formal lenders who deal with poor households in rural areas. Study of such factors will describe the interaction between poor households and formal lenders that are usually owned by governments in LDCs. This will also give an overview of credit market in rural areas and the ability of formal lenders to serve poor households.

1.1.1 Agricultural sector in the Libyan economy

Libyan economy during the 1950ies, before the era of oil wealth, was a very small economy and the country was one of the poorest countries in the world. The total population was less than one million, living mainly in the northern part of the country and they depended on rainfall for their livelihood activities. Population in the southern part of the country lived in small cities surrounded by villages, where the majority was depending on ground water for small agricultural activities, mainly for self –sufficiency during those years. The large numbers of people engaged in agriculture during the 1950ies reflect the absence of attractive alternative employment opportunities in the other sectors of the economy. During the last 30 years and after Libya starting exporting oil, the Libyan economy has been depending heavily on in this sector. It remains largely state controlled and regulated. According to the International Monetary Fund (IMF) (2003), the non-oil and private activities remain hindered by a complex regularity regime, widespread government intervention, and restrictive labor market practices.

¹ Transaction costs mean any other costs borrowers will pay to get credit such as traveling costs and other costs which do not include interest rates.

² Information that describes loan contracts in term of interest rate charged, repayment period collateral requirements...etc

The share of the agricultural sector in the Gross Domestic Product (GDP) during the (1950ies) was about 26%. In (1962), when oil production started, the share of agricultural sector in the GDP fell to 9% of the GDP, due to the increase of revenues from oil production. The value of food imports increased by 37% as compared to the (1950ies). Libya currently imports nearly 80% of its total food requirements. In the period (1970-1980) the shares of oil sector was around 50-65% of total GDP. Despite the greater political emphasis on the agricultural sector, still the oil sector reached the highest percentage in GDP. The share of agricultural sector in the GDP was very small during the (1970ies), and in fact in the (1980ies) the share fell to 2-3% of the GDP. During (1990ies) and up to (2004), the contribution to GDP has increased to 5-12% as depicted in figure 1-1.

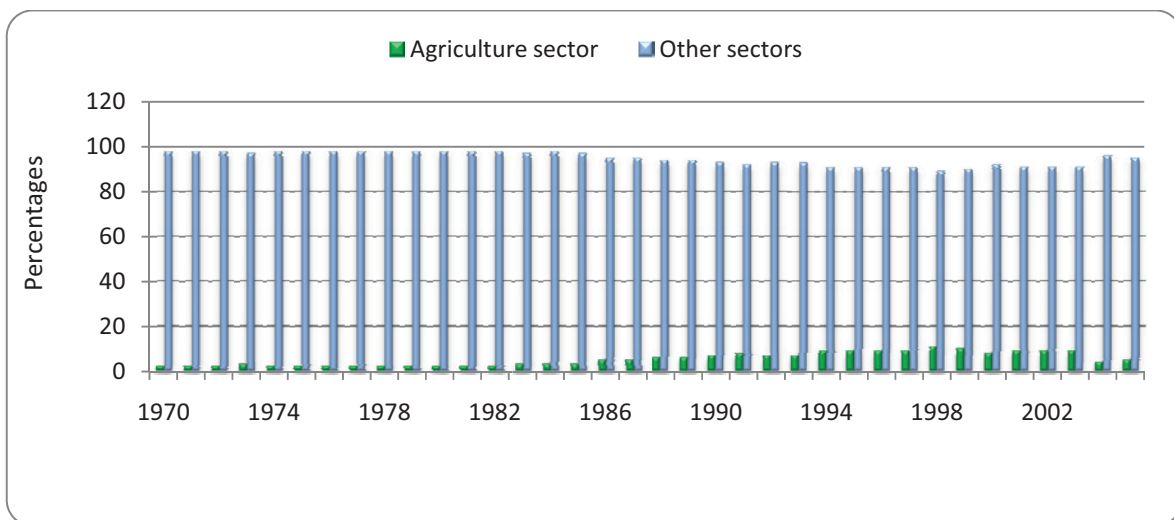


Figure 1-1: The shares of the agricultural sector in the total Libyan GDP

Source: Calculation based on data collected from Libyan Ministry of Planning.

The Libyan economic performance has been shaped by changes in oil revenues, at about 2.6% per year on an average; in (1990ies) for instance the real GDP growth was modest and volatile reflecting inefficiencies of the economy driven by state owned companies, stagnant oil-production and revenues, and the impact of economic sanctions. Since year (2000) according to the World Bank (WB), when the oil price has been increased, the GDP growth has reached 4.6%

in (2004). According to an International Monetary Fund (IMF) (2003), despite the growth of the Libyan economy due to the increase oil prices, non oil GDP is still small, private economic activities remains hindered by a complex regulatory regime, widespread government intervention and restrictive labor market practices as well as by a legacy of policy reversals.

However, investment of non-oil sector still low compared to the neighboring countries such as Egypt. According to WB report (2006), the share of oil production is more than 72% of GDP in (nominal terms), 93% of government revenues and 95% of exporting earning. The Libyan economy appears to be one of the less diversified oil-producing economies in the world, due the government interventions in the economy. The socialist pattern³ of governance adapted by the government in the (1970ies) by giving local authority in each sector in each city to have employee in government sectors, gave way to more than three quarter of employments in public sectors.

1.1.2 Libyan labor force issues

The high population growth during the last 35 years has lead to high rate of growth in the labor force. During the 1970ies and the early growth rate the 1980ies, Libyan population growth rate reached 4%, before decelerating to under 3% in the 1990ies. As a direct result of improvements in the income and health of the Libyan society, due to oil wealth, the population growth has lead to direct increase in the labor force during 1990ies; the labor force growth has reached 3.5% to 4.0% per year. Public sector employment grew massively between 1990 and 2004 to absorb the additional labor force growth, which leads to 75% of Libyan total employment in the public sector. In the period 2001-2004, the public sector employment capacity reached its limit, with clear evidence of over-employment. This unusual situation resulted in continues fall in public sector labor force productivity. In 2001, for example that according to Libyan Ministry of Labor and Training (LMLT) reports, government civil service and public sector employment represented 53% and 24% of the total employment of Libyan nationals, respectively.

³ The socialist pattern is a political system for local administration, which is give them the right to employ more labors in each sectors without taken permission for the ministries of each sectors, which lead to more than 75% of total labor in public sector. This system is not working any more since year 2004.

Agricultural employees' share (2005) was about 18% of total labor force, provided only 5% of the GDP. The rate of unemployment in the years 2000 and 2003 was estimated to be at least 30%. Figure1- 2 illustrates the distribution of labor force during the period 1962-2003.

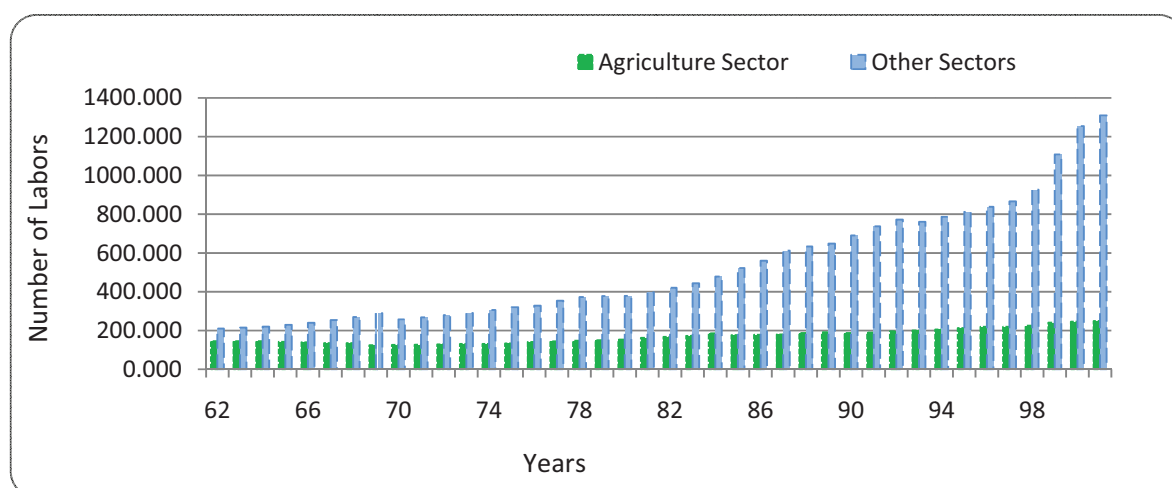


Figure 1-2: Total labor force distributed by sectors.

Source: Data collected from The Libyan Ministry of Labor and Training

In 2003, for example, the public sector has had the greatest share of total employment, it representing 50.7 %, followed by 13.8 % of manufacturing sector, retail trade and restaurants of 12.2 % and agricultural sector 6.3 %, etc. Table 1-1 representing employment by economic activities in year 2003.

Table 1-1: The distribution of employment by economic activities in 2003

Economic Activities	Percentage of shares of total labor force
Agriculture, Forestry and Fishing	6.3
Manufacturing Industries	13.8
Electricity, Gas And Water	4.0
Building and Constructions	2.9
Wholesale, Retailer Trade and Restaurants	12.2
Transportation , Storage and Communication	3.7
Public Service (including Education and Health care)	50.7
Other services	6.4
Total employment	100

Source: Libyan Ministry of Labor and Training, annual report 2003

From the table above it is very clear that the public sector is still over-employed⁴; this lead to a negative impact on the productivity and wages of labor who work in this sector. Since 1981 the nominal wages in the public sector remained frozen, in order to cover the large wage bill, due to the large number of employment in this sector. The Libyan authority is concerned about the situation that lead to 75% of total Libyan forces to the public sector. The following facts might explain the situation:

- People not educated and trained according to what the labor markets demands.
- The absence of the employment opportunities in the other sector, particularly the private sector, with more than 50% of population under the age 20, labor- market tensions will increase in the future.
- Decentralization, that has given the regional governments in the last 8 years the right to expand employment, has added more complexity to the labor problems in Libya.

In 2006, the wage bill increased to 50%. This raise in the public wage was accompanied by an initiation of large civil service reform, with about one third of public employees being transferred to central office for retraining or retrenchment. The Libyan Ministry of Labor Force and Training started to redistribute the employees from the public sector to other sectors, which might take several years to prepare the work force through training and education for new job opportunities outside the public sector. However, the main challenge for the Libyan government is to promote growth of the non-oil sector and foster diversification of its economy. According to the WB report (2006), Libya's unsuccessful experiment with state-driven model of economic development, based on import substitution, shows the limits in using oil revenues for financing investment of the public enterprises in selected industries. Such diversification of the economy will be achieved if far-reaching reforms are put in place to facilitate private sector development in all sectors. About 6.5% growth of the non-oil sector would be needed to reduce the unemployment rate- currently estimated to be 30 to 25% by half in 10 years period.

⁴ The shares of public employment is more than 50% from the total employment, this unusual situation, the maximum number of public employment should not be more than 20% of the total employment.

Despite the development plan implemented in 1970ies-1980ies that aimed to reach self-sufficiency as a national priority, and to increase the share of agricultural labor in total labor force, Libya still imports more than 80% of all food requirements and the shares of agricultural labor force decreased to 6% in the year (2003). Shortage of water is one of the main issue faced the agriculture. Animal husbandry is a significant activity but relies heavily on import of animal feed. Fishing resources are not fully exploited. Libya has a long coastal line which is about 2000 km with large stocks of tuna and sardines. A general lack of trawlers, ports and processing facilities dedicated to Libya's marine industries contributes to the low output of the sector comprising agriculture, forester and fishing. In the period (1981-1985), agricultural sector became the cornerstone of development plan and investment, the sector attracted high priority of funding the Man Made River Project (MMRP).The project is designed to bring water from the southern part of the country from aquifers beneath the Sahara to the northern part of the country, where more than 90% of the population lives. The aim of MMRP is to reduce the country's water shortage and encourage investment in agricultural sector.

1.1.3 Finance sector development and soundness

A strong and dynamic financial sector is essential to achieve high and sustainable economic growth. In Libya, formal banks represent the backbone of the financial system. The formal intermediaries (state-owned banks), are subject to Libyan Central Bank (LCB) and government regulations, where the role of private banks in Libya is still negligible. The operations of banks, for more than 30 years have been hampered by widespread state-ownership that is characterized by directed credit to state-owned enterprises and controlled interest rates. The formal banks owned by the government have played a dominating role on the credit market in Libya. In this study the financial institutions have been divided into two types; Agricultural Banks (ABs) and Non-Agricultural Banks (NABs).

1.1.3.1 Agricultural banks

Agricultural Central Bank (ACB) in Libya is established in the year 1955 mainly to support the agricultural sector. The government of Libya has been supporting the ACB from 1957 when the bank commenced operations with only 1 million Libyan Dinars (LYD), which was equivalent to

3 million (US\$)⁵. According to ACB annual report in (2002) “about 44 branches and offices distributed in different locations to support agricultural activities in rural-areas, with remarkable increases of the banks’ capital to 56 million LYD, which is equal 42 million US\$”. The aim was to create a systematic expansion of the agricultural banks credit infrastructure, to encourage investments in some agricultural activities and make the Libyan economy less vulnerable and not depend entirely on oil revenues. This emphasis from the Libyan government through intervention in the credit market which mainly provides subsidized loans to agricultural and other priority sectors and to meet the fast expanding demands for credit which is offered by the 44 agricultural bank branches (ABB’s)⁶. Agricultural Banks are offering different type of credits system to meet the demands for credit and to support different agricultural activities including rural housing. “According to ACB annual reports the bank has created different types of loans (short, medium and long-term loans)”. Figure (1-3) shows Loans distributed by ABBs during 1970-2003 in thousand Libyan Dinars.

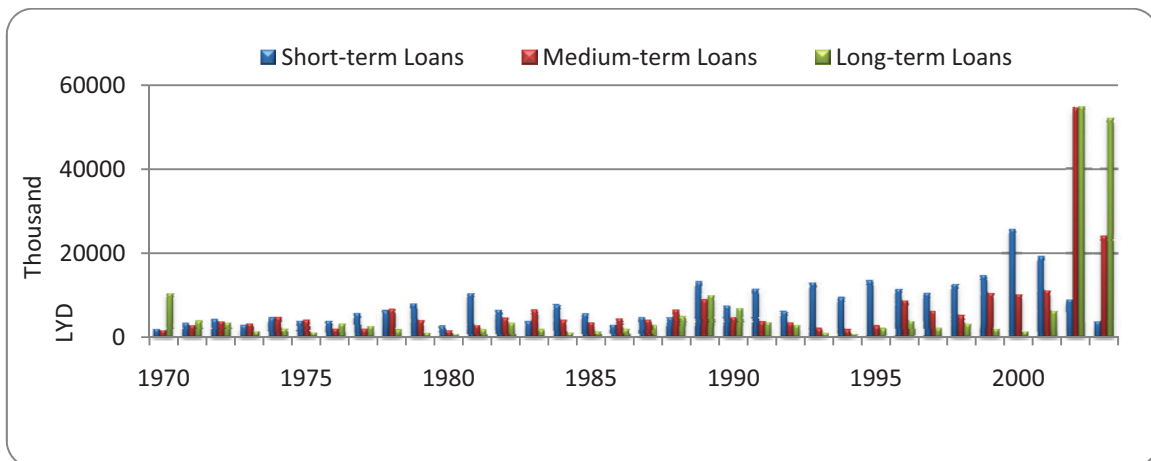


Figure 1-3: Total loans distributed by agricultural banks 1997-2003.

Source: Calculation based on agricultural central bank annual reports

In 1989 there was remarkable increase in all types of loans compared to the previous years. In the years (2002 and 2003) also the medium and long-term loans have been increased rapidly, the number of credits increased during the last 10 years, which reflects a new credit policy that pays

⁵ In 1957 the exchange rate : 1 LYD is = 0.30 US \$ and in 2002 1 LYD is = 0.75 US\$

⁶ Location of each agricultural banks are illustrated in map in page (67)

more intention in rural housing and some agricultural activities that need more capital compared to the previous years. That change in credit policy, which the government realized, is that investment in agricultural goes beyond the small loans. The provision of subsidized loans offered by ABB's at lower rate of interest compared to other financial institutions such as NAB's has led to the general belief that there is excess demand for credit offered by ABB's, because of lower interest rate compared to other banks. However, this might not always be true because other institutions such as NAB's also offer credit for different purposes at different interest rates that includes rural- housing.

1.1.3.2 Non-agricultural banks

These banks are other formal state-owned banks, which include all the national Commercial Banks, Real- estate Banks, Regional Banks and all other formal banks that offer credit in the market. These banks are also under the control of the LCB and the Libyan authority. The Commercial Banks for example are represent 90% of Libya's banking business. In (2006), according to the Libyan Ministry of Finance (LMF) and LCB, the Commercial Banks have some 14 billion LYD in aggregate assets; the aggregate banking system assets are equivalent to 60% of GDP, indicating that the domestic banking system has considerable potential for growth, particularly for a middle income, oil-producing country like Libya. Commercial bank loan portfolio accounts to aggregate up to 7 billion LYD that include loan/deposit ratio of about 50% of gross value. Despite the large assets of these banks and the government reform of the structure of ownership for some formal banks to include or increase private sector participation in the capital of such banks, still some obstacles facing these institutions. According to IMF reports (2001, 2002, 2005 and 2006), financial institutions are not be able to fully its role in the intermediation of national saving and financing of economic growth in the non-oil sector without avoiding such obstacles. The following issues mentioned in different reports should be taken into consideration to improve the role of financial institutions, particularly banks to improve the Libyan economy:

- Until recently, the public enterprise sector in Libya was the only beneficiary of corporate lending by banks. According to IMF report (2006), the banking sector channeled funds to public enterprises, while the marginal private sector consisted only of micro-enterprises with

no formal access to finance. For the new private sector to grow, including agricultural sector, which is the second largest sector, where around 18% of employees work in this sector, banks need to acquire the capacity to serve this new segment, and need to operate an environment conducive to the development of credit market.

- The second, issue which is faced by the financial institutions that are controlled by the LCB and government, is the lack of comprehensive credit information system. Credit information system is good for risk-assessment and for development of credit market. The development of a reliable and comprehensive credit information system as well as good market information system is essential to a well-functioning credit market.
- Full independence from LCB, which means, creating a strong legal framework for regulation of banking activities, in particular independence in the operation conduct of monetary policy in term of all financial activities including saving and lending to private sector and small-enterprises. In other words, state-owned banks need a clear strategy and an effective governance and independent management structure for their activities. To reach such goals, assistance might be needed for the state-owned banks in their drive towards building strong management structure adequately supported by professional banking teams and building more up-to date skills in such critical areas as credit, investment, risk management, control system and management information in general.
- Some monetary policy progress has been done such as for partial interest rate liberalization. However, steps to liberalize further interest rates would be conditioned by the development of a well-functioning liquid money market. Since 2002, the government of Libya and the LCB started of a new finance policy that mainly focuses on adjustment in ownership structure to include and increase private sector participation in the capital of commercial banks including partial interest rate liberalization and allowing for the first time foreign investors to hold shares in some banks. As a beginning BNP Paribas acquired 19% of Sahara Bank's capital on September 18, 2007.

1.2 OBJECTIVES AND RESEARCH QUESTIONS

The study focuses on the interaction between rural households and financial institutions in three different locations. Such studies became very important in recent years, mainly focusing on characteristics of households as the main borrowers in the rural areas. Households' socio-economic characteristics such as age, gender, income, family size, and farm characteristics such as water-availability, soil-types and machinery used in farms etc, all these factors might have an impact of access and credit applications. Household characteristics are important for demand and supply in credit markets. Therefore, the study determines the affect of such factors on access and credit applications among households.

In this empirical study, the extent of credit market in rural areas is investigated. What are the main factors affecting such extent? Who are the main players in the rural-credit market? The study focuses on the affects of household's characteristics on access, participations and applications for credit, comparing three different locations, which might represent the whole country. In particular, an important question is the ability of Libyan microfinance lenders to balance the trade-off between the need to the payoff of the micro-credit lending program and the desire to serve the maximum number of rural households.

Different econometric models will be used in the study to answer these equations. The first model investigates whether households in rural areas are able to have access to the credit market; the model given is to investigate the main households' characteristics that have a significant impact on access to credit. The second model is choice model; the model determines households' credit applications, the model will determine the impact of households' socio-economic characteristics, farm and formal lenders' characteristics on credit applications in the rural areas. The third model is to determine the factors that have impact on amount of credits received among successful applicants. The fourth and final model is to determine credit constraint among households by investigating the main factors that might lead to such constraints.

The empirical analysis of the models just mentioned above is based on; first, the probability of borrowers from formal finance institutions (formal banks) is determined by bank decision on access. The second hypothesis is that the probability of applying for agricultural bank is expected

to be very high because these banks offer loans at the cheapest interest rate in the market. The third and final assumption, based on the previous hypothesis, that households have positive demand for credit offered by agricultural banks and the last plays the major role in credit market, particularly in rural areas, particularly there are more than 44 agricultural bank branches distributed across the whole country.

1.3 OUTLINE OF THE THESIS

The thesis is composed of ten chapters. The first part focuses mainly on the general outlines of the thesis, such as introduction, main research question; objectives of the research, some facts on the Libyan economy and basic information on the financial sector. The second part discusses credit in theory of economic and finance that focuses on the mechanisms of financial institutions through credit and their impact on incomes, investment and poverty reduction. In the third part of the thesis focuses on the literature survey that highlights the methodologies used to measure access to credit and credit constraints. The literature also discusses credit applications in rural areas and main factors that might have impact on these concepts. The fourth part discusses the methods and data used for empirical chapters, more details are given on determinants of the sample size, Rural-Households Survey (RHS) locations, where 330 rural households are interviewed and the conceptual framework that is used in this study. The fifth part gives the statistics of descriptions and emerging patterns of access and credit applications among households in the Libyan rural areas, the information is based on RHS. In chapter, six and seven econometric models are used to determine the impact of factors that affect access and credit applications in rural areas respectively. Chapter eight estimates factors that determine amount of credit received among successful applicants and chapter nine tests whether households face credit constraints or not and what factors might lead to credit constraints among households. Chapter ten concludes the research results and offers policy recommendations that are related to each concept tested in the study.

Chapter 2

2. CREDIT INFRASTRUCTURE AND ECONOMIC THEORY

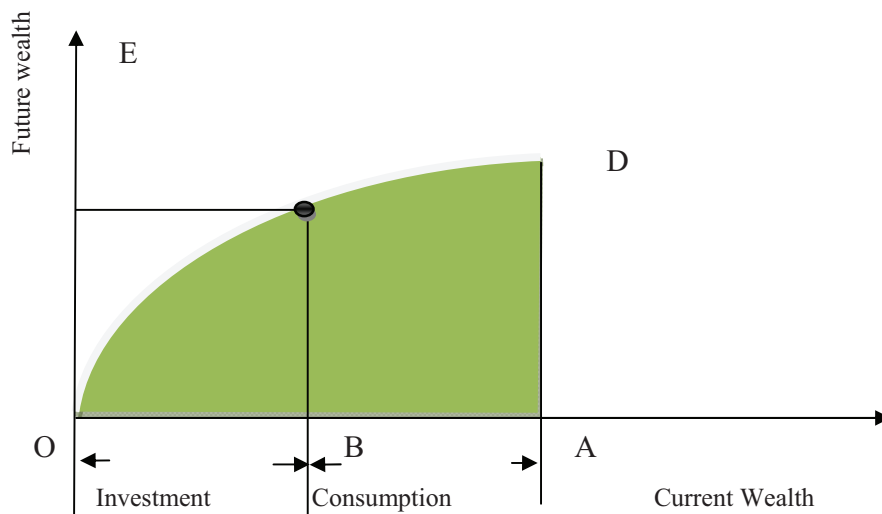
2.1 THE THEORY OF INVESTMENT

In this section, the discussion is on the theory of investment and saving. Firms and households decide to save money or to invest and probably apply for more money through credit market. The decision made by firms and households in the three cases: save, invest and borrow depends on others. The interest rate sends the signal to all. In this section the demand for investment is discussed by developing an explanation of the factors that shift the demand curve for investment and supply of financial means considering the supply curve for saving, which will explain the co-movement of investment, saving and the rate of interest. At the onset a discussion on production at different point of time with respect to input and output is discussed.

2.1.1 The production possibility set

Household decision is essential in deciding how to allocate its produced commodities between consumption goods and investment goods. For example, a few hours spent producing a fishing net will reduce the current production of fish but it will increase the ability to catch additional fish in the future. Larger firms or large farms producers should make exactly the same kind of decision. The horizontal axis in graph (2-1) measures two things. Reading from left to right, beginning at point O, it measures the quantity of commodities that a farmer invests. For example if a farmer produces wheat in his farm, part of his production will be consumed inside his farm for feeding livestock for instance, the other part of his production is sold in the market, and in turn used to buy other production inputs for the next crop season. Reading from right to left, beginning at point A, it measures the quantity of commodities a farmer consumes. For example, suppose that a farmer chooses to invest the resource OB and consumes the resource BA, in this case, he will leave himself the resource OE to be divided between consumption and investments in the future. The green area shows the feasible combination of wealth today and wealth tomorrow. The production possibilities set has a frontier that slopes upward because the more the farmer or household invests in the present the greater will be his wealth in the future.

Moving from left to right, beginning at point O, the slope of this frontier gets flatter reflecting the assumption of diminishing return, which means that a farmer spends more time to build tools; each additional tool is marginally less productive than the one before. Graph (2-1) illustrates the production possibility set.



Graph 2-1: The inter-temporal production possibilities set.

Source: Farmers (1997), p (87)

2.1.2 Maximizing profits

Economic profit is defined to be the difference between the revenue a firm or household receives and the costs that it incurs. It is important to understand that all costs must be included in the calculation of profit. If a farmer works in his farm, his salary as an employee should be counted as a cost. If the farmer has to repay a bank loan as monthly installment payments, these interest payments must be counted as a cost of production. Firms and households borrow from the capital market and choose how much money to borrow to maximize profits. Consider the profit maximization problem at the short-run, also known as the restricted profit function. Suppose that $f(x_1, x_2)$ is production function of a firm, and x_1 is the capital input borrowed from the market and input 2 is fixed at some level \bar{x}_2 . Let p be the price of output, and let w_1 and w_2 be the price

of the two inputs. Assume the firm doesn't affect the price of inputs in the market. Then the profit-maximization problem facing the firm can be written as:

$$\max_{x_1} pf(x_1, \bar{x}_2) - w_1x_1 - w_2\bar{x}_2. \quad (2.1)$$

Equation (2.2) represents the optimal choice of factor 1. If x_1^* is the profit-maximizing choice of factor 1, then the output price times the marginal product of factor 1 should equal the price of factor 1.

$$p MP_1(x_1^*, \bar{x}_2) = w_1. \quad (2.2)$$

This means that profit maximizing choice of inputs and outputs, the value of marginal product, $p MP_1(x_1^*, \bar{x}_2)$, should equal the factor price w_1 . In other words, the value of marginal product of a factor should equal its price. If a firm employs a little more of factor 1, Δx_1 , the firm produce $\Delta y = MP_1 \Delta x_1$ more output that is worth $p MP_1 \Delta x_1$. But this marginal output costs $w_1 \Delta x_1$ to produce. If the value of marginal product exceeds its cost, then the profit can be increased by increasing input 1. If the value of the marginal product is less than its cost, then profit can be increased by decreasing the level of input 1. We can see this condition graphically, in graph (2-2) the curved line presents the production function holding factor 2 fixed at \bar{x}_2 . Using y to denote the output of firm, profit is give by

$$\pi = py - w_1x_1 - w_2\bar{x}_2 \quad (2.3)$$

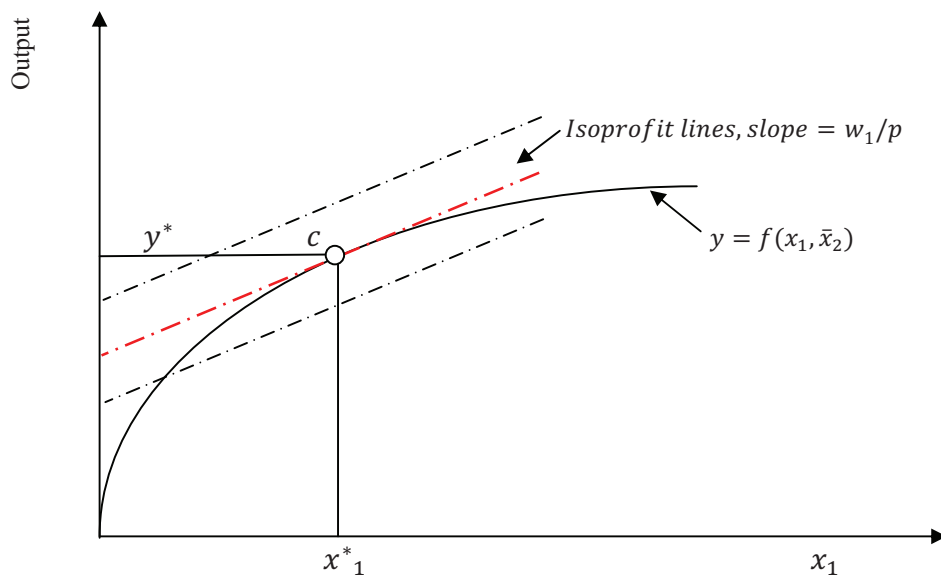
The expression can be solved for y to express output as function of x_1 .

$$y = \frac{\pi}{p} + \frac{w_2}{p} \bar{x}_2 + \frac{w_1}{p} x_1 \quad (2.4)$$

The equation describes isoprofit lines. These are just combinations of one input good and the output good that give a constant level of profit, π . As π varies a family of parallel straight lines each with a slope of w_1/p and each having a vertical intercept of $\pi/p + w_2\bar{x}_2/p$, which

measures the profits plus fixed costs of the firm are derived. Let's denote the constant term of equation (2.4) by c , or lets suppose that; $c = \frac{\pi}{p} + \frac{w_2}{p} \bar{x}_2$.

The profit-maximization problem is to find the point on the production function that has highest associated isoprofit line. The maximum profit is the point where one of the isoprofit lines is exactly tangent to the production function yielding profit equal to point c , which is illustrated in graph (2-2); it is characterized by a tangency condition: the slope of production function should equal the slope of isoprofit line. The three isoprofit lines drawn in the graph, the line that cuts at the axis at c is the line with highest profit that contains a feasible point. The fixed costs are fixed, so the only thing that really varies as we move from one isoprofit line to another is the level of profits. The firm chooses the input and output combination that lies on the highest isoprofit line, which represents by (x^*_1, y^*) .



Graph 2-2: The decision that be made by profit maximization firm.

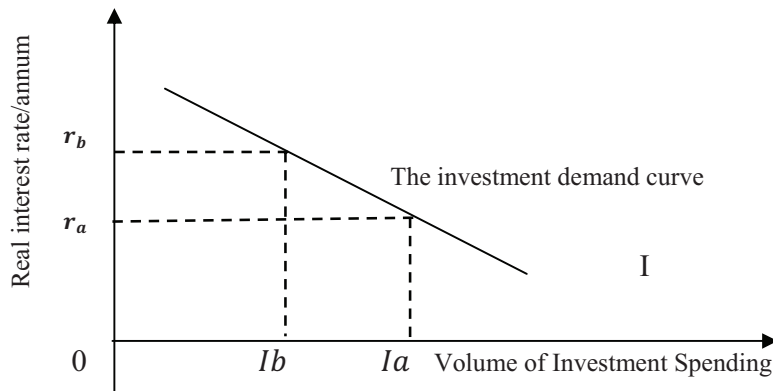
Source: This graph is adapted from Varian (2006), p (341)

2.1.3 The investment demand curve

The classical theory of interest rate was developed during the eighteenth and nineteenth centuries by British economists and elaborated by Irving Fisher (1930) and others more recently. The classical theory argues that two forces determine the rate of interest: (1) the supply of savings, derived mainly from household and (2) the demand for capital, coming mainly from business sector, which include small and big firms.

The classical theory of saving and investment assumes that firms and households can borrow and lend freely at single rate of interest. In fact, when interest rate is lower r_a graph (2-3) means the cost of investing is less, households and firms choose relatively high amount of investment. The second case, when interest rate r_b , which is higher than r_a households and firms choose to invest less, these inverse relationships represent the investment demand curve. If the interest rate rises, fewer investment projects are profitable and quantity of investment demand falls. For example, a person would like to buy a new house, at higher interest rate; the greater is the cost of carrying a mortgage. A \$100,000 mortgage costs \$ 8000 per year if the interest rate is 8% and \$10,000 per year if interest rate is 10%. As interest rate rises, the cost of owning a house rises, and the demand for new homes falls.

Graph (2-3) the interest rate is on the vertical axis and the quantity of investment demanded on horizontal axis. Suppose the amount of credits received represent the investment in agriculture or other economic activities, then households or firms are going to invest more when interest rate is low and they invest less when interest rate is high, holding other factors constant.



Graph 2-3: Deriving the investment demand curve

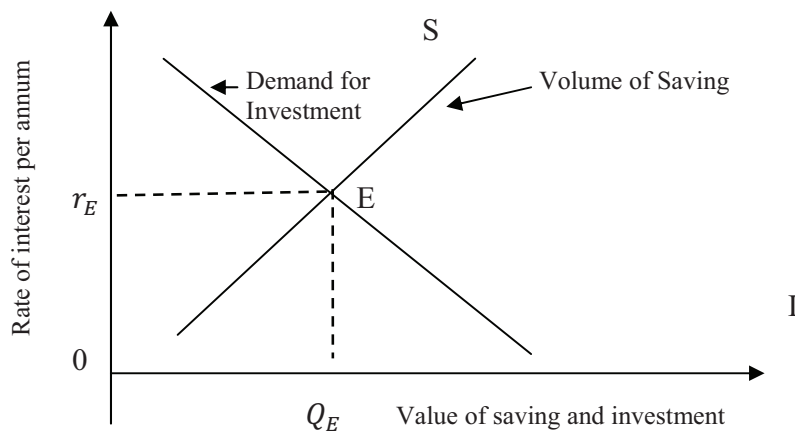
Source: adapted from Peter S. Rose (2005), p. 219

Interest rate plays an important role in the economy. Economists distinguish between the nominal interest rate and real interest rate. The distinction is relevant when overall level of prices is changing. The nominal interest rate is the interest rate as usually reported: it is the rate of that investors pay to borrow money. The real interest rate is the nominal interest rate corrected for the effects of inflation. If the nominal interest rate is 8% and the inflation rate is 3%, then the real interest rate is 5%.

Despite, the negative relationship between investment and level of interest rate, the interest rate is not the only factor that influences investment decision. The process of investment decision making by households or firms is complex and depends on a host of qualitative and quantitative factors. Households in rural areas, for example, take into account, the profitability of the production, price of commodities, price of input, and current level of production with the capacity of its existing facilities, etc. Although the investment decision-making process varies from individual to individual, each household or farmer generally makes some estimate of his investment decision cost and revenue.

In the classical theory, economists believed that interest rates in financial markets are determined by the interplay of supply of saving and the demand of investment. More specifically the

equilibrium of interest rate will occur at the point where the quantity of savings supplied to the market is exactly equal to the quantity of funds demanded for investment. The previous graph (2-3) represents the quantity of funds demanded at different level of interest rates. In graph (2-4) the equilibrium rate of interest occur at point E , where the equilibrium rate of interest is r_E and the equilibrium of quantity of capital funds traded in financial market is Q_E .



Graph 2-4: The equilibrium of rate of interest in the classical theory

Source: adapted from Peter S. Rose. (2005), p 220

The acts of saving and lending, borrowing and investing are intimately linked through financial system and one factor that significantly influences and binds all of them together is the rate of interest. The rate of interest is the price the borrowers must pay to secure scarce loan-able fund from a lender for an agreed-upon period. It is the price of credit paid to the lender for an agreed period.

Households purchase a variety of goods and services that might be used as production inputs or for consumption how much depends on their income, savings or use of credit. Recent research indicates that households are not particularly responsive to the rate of interest when they seek credit, but also focus instead principally on the non-price terms of credit, such as the repayment period, maturity, and size of installment payments etc.

2.2 CREDIT AND ECONOMIC GROWTH

Credit is one of the crucial factors that determine economic growth and raises the amount of money can be spent. Several studies produced by researchers on comparative economic growth have found a positive robust correlation between growth and the share of investment in GDP. However, this might not be true in LDCs, due to the difficulties to finance investment through the credit market. A large part of investment in LDCs in general has been financed by public sector that is controlled by the authorities through formal financial and international organizations. Such difficulties have an impact on production, investment and the diversifications of households' incomes that depended heavily on agriculture.

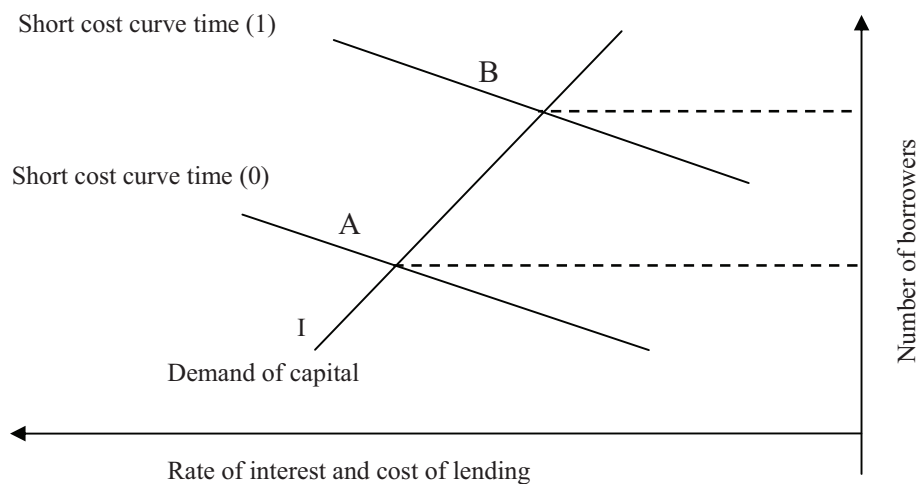
In last two decades, the investment in agricultural sector decreased, even in countries that depend heavily in agriculture sector such as India and china, both countries have huge investment in non-agricultural sectors, this lead to have a direct impact on factor productivity and size of agriculture in the economy of each country. The low shares of agriculture in some of LDCs economies is due to low resource inflows, which include credit inflows, this need to be improved for increasing this share. Agricultural sector as well as other sectors in the economy requires credit inflows that increase factor productivity, which has impacts on household incomes and poverty reduction. In the last 20 years, the productivity of agricultural sector decreased comparing with other sector in the Libyan economy, due to lower investment on agriculture and heavily depends on oil sector. Therefore, Access to credit for more farmers through sufficient credit programs is important for realizing the full potential of agriculture as profitable activity.

In this section, the analytical framework is to examine the impact of credit on economic growth, which focuses on how availability of credit to low income farmers that will influence the farmers output, incomes and poverty.

2.2.1 Impact of credit on investment

This part of the thesis examines the impact of credit for low-income farmers on output and poverty. The key links of the following aspects are discussed: Investment, employment, and poverty reduction.

Graph (2-5) illustrates the demand for credit and the relations to the interest rates and lending costs. Other things being equal, the curve for investment demand will be downward sloping as discussed in graph (2-3): The lower rate of interest, the lower rate of return that is required to realize a profit and the larger the amount of investment that will be profitable. The investment function I in the graph (2-5) is defined subjectively by each investor; it will be subject to shifts according to at least level of market demand, the price of investment goods and the government policies that affecting the ability of investors to retain any profits they make. In the short-term costs of credit are up-wards sloping: the more borrowers the greater the resource, which is needed from lenders and high cost of credit. But if the cost curve shifts downwards over time, the lender can move from point A to point B on the demand curve, and be able to lend at progressively lower interest rate.



Graph 2-5: Demand for credit in the relation to interest rate and lending cost.

Source: Hulme and Mosley, (1996), p. 33

2.2.2 Impact of credit on choice of technology and employment

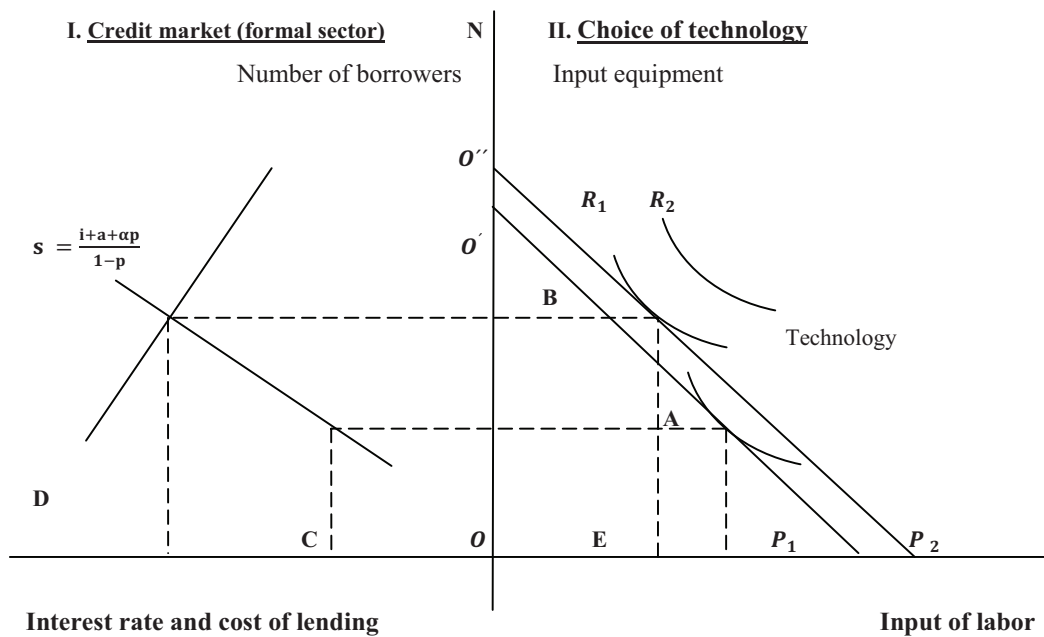
Farmers who have access to credit will adapt new technology to increase the production and also other income. The new pattern of income earning opportunities, which results from credit-financed investment will have direct and indirect impact on production and consumption of households. In this section, the discussion focuses on, how adapting new technology will effect the employment in agricultural sector.

The installation of new technology sometimes causes work losses of employees. For example buying a harvester-machine will displace many employees. Graph (2-6) illustrates the impacts of credit by installing new technology such as buying new machine or equipment that might displace employees who work the in agricultural sector. Quadrant (I) of this graph is identical to graph (2-5), which illustrates the number of borrower at the level of interest rate, where ($s = \frac{i+a+\alpha p}{1-p}$), is the short run cost curve, (i) is interest rate paid per unit on borrowing and saving deposit, (a) is administrative costs per unit of principal, (α) is the share of principle of each loan that has to be paid back per time period to the lender and (p) is expected default rate on loan. The interest rate charged by formal lender, determined by cost of borrowing, administration cost and the probability of default. The number of borrowers will increase at lower interest rates and decrease at higher interest rates that are represented by down-slope D, which is based on vertical axis ON that represents the number of borrowers.

Quadrant (II) is a standard choice of technology available to the farmer. In case of faster growth of output that occurs by investment generated by more credit, represented by $O'A$ line, that needs more labor. The flatter the line $O'A$ in the relation to horizontal axis, the greater will be the number of new income-earning opportunities that can be created. The employment that is created by new investment depends on the growth, price of agricultural inputs, outputs and projects return overall. The employment balance is either positive or negative as shown in Graph (2-6).

In agriculture for example, a combination of high yielding varieties, fertilizers and irrigation facilities, which can only be envisaged once the financial constrains has been relaxed. Such new technology adapted by farmers and represented in graph (2-6) by curves $R1$ and $R2$, once if it

becomes financially accessible, it may become rational to switch to more capital-intensive technique $O''B$ even without any change in relative factor prices. The more credit available and subsidized to low income farmers, the more likely are outcomes to occur. Using a new technology in farms such as using irrigation system or buying new machine, this will have important effects on the rural economy. First, it will improve the overall food supply, while the prices might decline and thus will improve the welfare of the farmers overall. Second, employees will lose their jobs and might move to other sectors. Mundlak (2000) in his study of 148 countries, comparing the two years 1950 and 1990, indicated that the median share of agricultural labor force is 70% in 1950 and fell to 33% in 1990. Therefore, understanding the process of agricultural labor movement might be a good research area.



Graph 2-6: Inter-linkage between credit market and choice of technology.

Source: Hulme and Mosley, (1996), p. 35

2.2.3 Impact of credit on poverty reduction

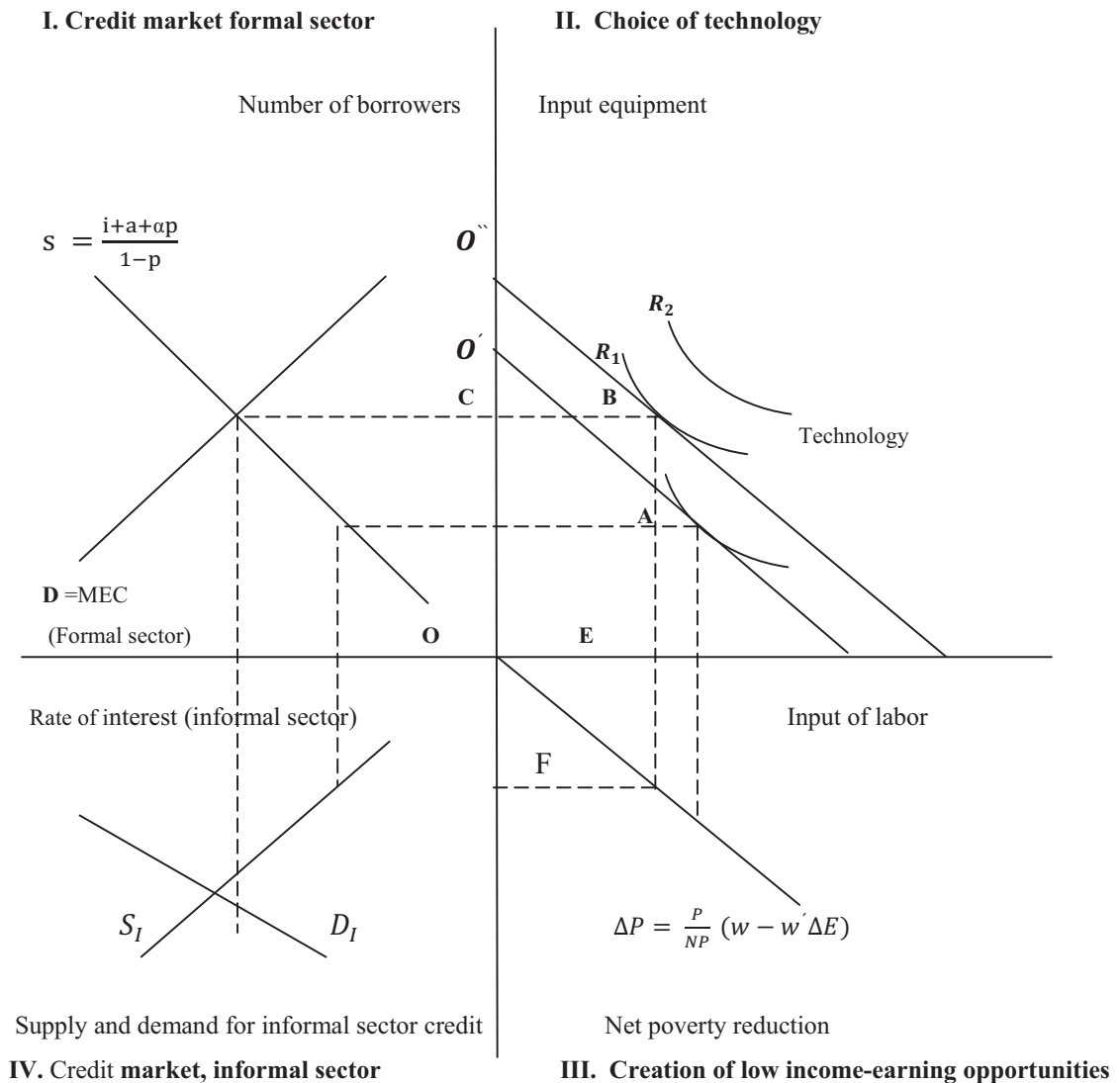
In this section, the question examined is how effectively reducing the new income generated by credit programs poverty. The discussion will focus on absolute poverty reduction (that is the number of people below the poverty line, whom the credit program offered by lenders should assist). Following the theoretical discussion by Hulme and Mosley (1996), if parts of employees lose their jobs as result of investment created by a credit program, change can in property, ΔP , be a function of employment change ΔE might be represented as following:

$\Delta P = \frac{P}{NP} (w - \acute{w})\Delta E$, where, P and NP are the proportions of poor and non-poor respectively⁷, w is the wage rate and \acute{w} is average income of poor households before employment. The impact of credit available to poor or low-income households will generate new incomes that reduce the poverty among them. Graphically, we can add another quadrant to graph (2-6) that shows the impact of credit on poverty reduction.

Quadrant (III), any extent of job opportunities through new investment that showed in quadrants (I and II), poverty will fall as a direct consequence of any employment created. Reducing the poverty will depend on different policies and might face political and economic obstacles in LDCs.

Quadrant (IV), representing the relationship between the formal and informal institutions on credit market. The assumption would be the substitution as formal institution in quadrant (I) expand on credit market; it takes away business from the informal credit institutions. However, reality may be more complex and need another research that focuses on the relationship between formal and informal institutions on credit market. In graph (2-7) if formal lenders lending amount of credit “OC” to new borrowers at an interest rate “OD” that will generate investment “OB”, employment creation “OE” and poverty reduction “OF”.

⁷ Poor households are below poverty line and non-poor households are above poverty line.

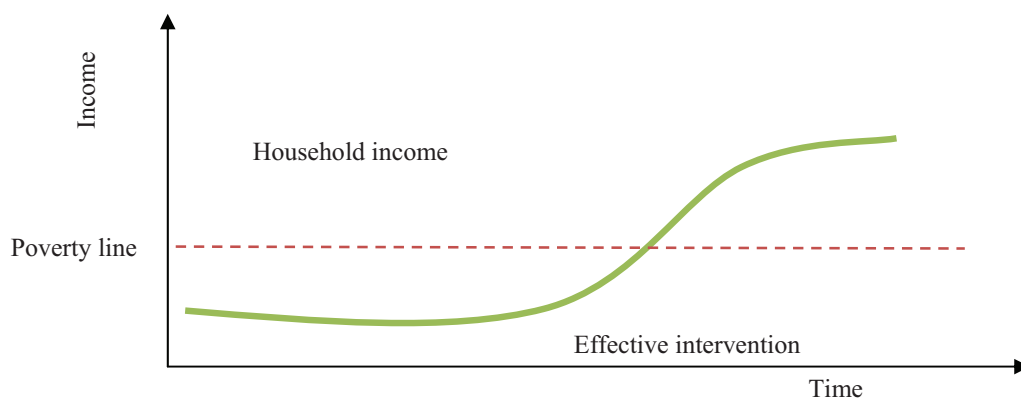


Graph 2-7: Inter-linkage between credit market, choice of technology and income.

Source: Hulme and Mosley, (1996), p.39

However, reducing poverty it not an easy task, economists, policy-makers and even international organizations, are considering reducing poverty level as an important strategic task. A concentration on poverty as 'income- poverty' is usually associated with a conceptualization of poverty reduction as moving household from a stable below poverty line to a stable above poverty line.

The definition of what poverty meant, how it might be measured and how the poor constitute is a contested issue. The questions are whether the poverty is largely about material needs or whether it is about a set of needs, which include more needs that are related to the measurement of consumption, usually by using income as a surrogate. Using “income poverty” approach has been heavily criticized for its reductionism and the bias to the measurable Chamber (1995) it has considerable strengths in term of permitting different people to their most pressing material needs. However, the majority of national governments and development agencies use this approach for their analyses of poverty and anti-poverty policies. Graph (2-8) illustrates poverty-reduction using income poverty-approach that focuses on promotional strategies raising persistently low incomes that means in financial terms provide credit for low-income households.



Graph 2-8: Poverty reduction as conceptualized by income-poverty-approach.

Source: Hulme and Mosley (1996), p. 107

Recently, there is a broad agreement that income is inadequate of welfare. Very poor people identify themselves as experiences that are not captured by income-poverty measures. These include vulnerability to a sudden dramatic decrease in consumption levels, ill health and physical weakness, social inferiority, powerlessness, humiliation and isolation. Such dimensions of poverty are significant in their own right and are essential analytical components for the understanding of income poverty.

2.3 FINANCIAL PERFORMANCE AND SUSTAINABILITY

In the previous sections, the discussion was on the impact of credit on the choice of technology in agriculture and impacts of credit on poverty reduction of households. In this section, we look at financial institutions in the relationship to households and development. The discussion focuses on the impact of financial institution management's on poverty reduction and different lending approach that are used in some successful financial institutions.

2.3.1 How financial markets create value

Credit originally means belief or trust, its Latin root is *credere* (Oxford Dictionary). Trust is fundamental condition for credit. Borrowers and lenders must have a bond of mutual trust. They must be confident about the behavior of each other as it could affect their financial relation. Credit contracts create value in the sense that the value of credit exchanged for promises of repayment of loan value plus interest rate. The question is how financial markets create value. The answer related to another two concepts in the finance, which are risk and confidence⁸. Risk expected⁹ by every credit contract or even in every financial transaction, because the future cannot predicted with certainty. When there is small risk among borrowers' investments projects that increase lenders' confidences, a lot of value can be created. There are three ways of, which financial markets create value.

2.3.1.1 Lengthening term structures

The structures mean here a time horizon, or movement towards a time horizon, in the credit markets. Term structure is related to credit size, when the time horizons are short, it may be possible to borrow against the next pay cheque or next harvested season. If the term structure is longer, it may possible to borrow against large number of expected cheque or against several harvested seasons. In normal times, banks are willing to lend to longer maturities than they borrow, in order to increase the spread between their cost of funds and rate of interest. Term structure depends also on the expectations, the longer into the future promise extends, the higher its risk, other things remain equal. This is because the distant future is more uncertain than the

⁸ Confident in credit market means the trust of behavior between borrower and lenders, which include correct information that is related to borrowers that require on each credit contracts.

⁹ Risk means in credit market, any violation of credit contracts, such delaying repayment of credit by borrower or default etc.

near future, which means more risks. In overall terms, some governments influence confidence because of their role in national economic management and enforce laws.

2.3.1.2 Reducing transaction cost

Loan applications, often face large transaction costs in obtaining access to formal credit. First, rural-households have to locate potential source of credit and find out what sort of services, with various term of conditions, might be available. They also provide information and bear the costs of establishing credibility. Borrowers in rural areas with poor communications may face higher transport costs and spend lots of time travelling to visit formal banks or other credit providers. Moreover, they have to wait for long period in order to obtain decision from lender, with lots of negotiation regarding loan term conditions. A higher transaction cost may encourage borrowers to default if the consequences of default are not serious, which may discourage lenders from developing new types of credit arrangements and therefore not making value in such situation.

2.3.1.3 Refining valuation processes

Valuation processes is based on what a lender believes he/she is lending against. Changes of the perception of the lender greatly influence the credit decision on whether to lend, the sizing of the loan and the term and conditions attached to the loan. The most refining valuation process in a way that finds value where none existed before, this method is used for instance by the Grameen Bank in Bangladesh,(GBB) where its clients are most entirely very poor women, some of its borrowers had never handled money, before borrowing from GBB. The GBB has created value through a specific lending management, lending through groups of five women each of whom is not closely related by blood or marriage, and the members themselves from each group. Members are supported by each other to repay their loans when a member has a problem.

2.3.2 The management of financial institutions for the poor

The impact of the financial institutions on poverty-reduction is a center issue of development institutions and policy-makers. This section focuses on the relative success of some institutions in poor countries, comparing institutional features and focuses especially on structure matters. In this section the discussion also examines management at different levels.

2.3.2.1 The structural features of financial institutions

It is important that any commercial organizations, including finance development institutions, in term of profit they make that is important to sustain themselves. However, if profits depend on external subsidy, they imply nothing about the efficiency of organizations, or even about sustainability. A comparison of the key structural characteristics of different institutions might give important implications for several areas of policy. A comparison between different institutions done by Yaron, (1992); Bangladesh Institute of Development Studies (BIDS), (1994), he found three of eight institutions are state-owned, a fourth Grameen Bank is jointly state-owned and member-owned and the others are Non-Government Organizations (NGOs). First, the comparison indicates that the private, public sectors and NGOs in developing countries are able to deliver services. The majority of these organizations have adopted management methods and techniques derived from private sector. Second, the successful organizations have adopted intensive management operational structures. A successful case such as the Grameen Bank of Bangladesh has an effective financial service for poor people particularly who live in rural areas that are based on a mobile banking approach. This approach involves bank-workers to go to the customers and not vice-versa. Third, comparing structure features of successful institutions, the majority of these institutions practice a significant degree of decentralized decision-making. The operational decisions such as monitoring loans, repayment issues and other operations that are related to borrowers are the duty of branch-level, where the other strategic decisions such as opening a new branch or design lending programs are the duty of the main-office or central banks.

The formal banks in Libya are under the government regulations, including agricultural banks that are established to support the agricultural sector. Agricultural banks in Libya are supporting agricultural sector through credit programs offered every year. Agricultural central bank, through 44 branches distributed in different locations offering various type of credit that cover different agricultural activities and seasonal credit that support livestock holders in dry seasons. These types of credit have different rate of interest, which are cheaper compared to other credit offered by non-agricultural banks. Despite large number of agricultural banks in Libya, these banks do not work appropriately in rural areas, most of the branches are located in the cities, which means that poor households that live far from cities need time and high travel costs to get information on credit, meanwhile these banks did not adapted mobile-banking approach, that reduce cost of travel of households.

2.3.2.2 Staff training

The human resource management can provide a large number of field staff for institutions in LCDs that will have positive influence in their quality of providing loan and other services for households in rural areas. Agricultural banks staff in Libya still need a lot of training that improve the banks management, which can understanding very well the nature of households that live in rural areas. A successful institution such as the Grameen Bank of Bangladesh is using university graduates for field-level managers and people with higher secondary school certificates as village-level workers. For example the Grameen Bank's training expenses represent around 28% of annual administrative costs, Yaron (1991). The majority of institutions in Bangladesh and Indonesia are focusing on staff training in term of technical capacities and motivation, devoting substantial financial resources and time to this function. Hossain, (1988) has found that the Grameen Bank of Bangladesh 26% of recruits dropped-out before their training complete. Maintaining of such training by practices including competitive salaries is an important instrument that aims to understand the nature of poverty among households in rural areas.

2.3.2.3 Managing borrowers and savers

This section focuses on, the different approaches used by financial institutions in low-income countries. There are three approaches used; solidarity group approach, co-operative approach and individual customer approach. Different combination of management between fieldworkers and borrowers or savers is used in the three approaches. However, the differing financial needs of specific households and individuals within households make it infeasible to specify a single optimal model for the need of low-income families.

2.3.2.3.1 Solidarity group approach of borrowing

This approach has been popularized by the Grameen Bank, the main idea of this approach is the formulation of self-selected groups of borrowers usually (4-8) borrowers who take on responsibility for loan of all group members. The Grameen bank for example has (20-30) members as groups, and other institutions may have between (20-70) members, the groups provide a second level of collective liability and meeting. The selected-groups of borrowers are responsible for supervising loans and ensuring repayment, reducing risk and administrative costs. Some banks create center for each group. The advantage of this approach is that solidarity-groups contribute to high levels of repayment by providing free labor and social pressures that make the repayment within the group-member their top of priority.

2.3.2.3.2 Co-operative group approach of borrowing

This type of approach is based on the capacity of co-operative-groups to accumulate saving and make loans to people who live in rural areas. The common feature of this approach is that financial co-operatives and credit unions which are members must purchase a share in the organization, and must deposit specific proportion often (10-25)% of their loan they wish to borrow in a saving account and must have two or more of the existing members of the organization guarantee the repayment of their loan. This type of approach has also some other conditions within the group, for example one of the primary conditions is that the member of a co-operative group must involve in the management of the groups and must also have the technical capacities to manage and oversee the management of their organizations. This approach is used by some financial institutions, for example the Grameen Bank Bangladesh

seeks only for poor members, where other banks concentrate on low-income households or middle –income groups.

2.3.2.3.3 Individual approach of borrowing

This type of approach deals with borrowers as individuals, by taking savings from them and focusing on personal collateral, income, etc, some institutions have provided individuals with positive incentives to repay in terms of repeat loan eligibility based on repayment performance. Such types of lending programs charge relatively high interest rates, but have relatively low transaction costs. According to some studies in individual approach, this type of approach might not work in very poor areas, where the majority of people have a little collateral or some no collateral at all. However, this approach probably works in some other countries, such as middle income countries, with individuals who have collateral or one of the members of the family has permanent income. This approach is appropriate for those who did not like to participate in group-lending programs. This approach is used in all financial institutions in Libya including agricultural banks, this approach might exclude poor households that have no or little collateral form credit programs.

Each of these approaches of borrowing can work well, when it is carefully designed and skillfully managed, creates incentive structure for borrowers and higher repayment among them. The fundamental similarity between the three model of approaches (if effectively implemented) is that, in various contexts, they produce financial charges and transaction costs that borrowers and savers find more attractive than those provided by other intermediaries. However, successful financial institutions should considering household social-economic characteristics such as type of collateral, farm size, incomes, type of agricultural activities, when they apply a certain approach to borrow among poor households.

2.4 CREDIT CHANNEL IN THE FINANCIAL INSTITUTIONS

2.4.1 Financial institutions

The important role of the banking system is stabilizing the level of economic activities. Banks provide funds from savers and provide them to investors. If the banking system does not provide firms and households funds through the credit market, firms and households that have liquidity constrain will not be able to invest, and the economy will be affected. More broadly the bank system by its actions, affects the level of investment, and also affects the level of economic activities. Sharp declines in investment affect growth of a country's economy overall.

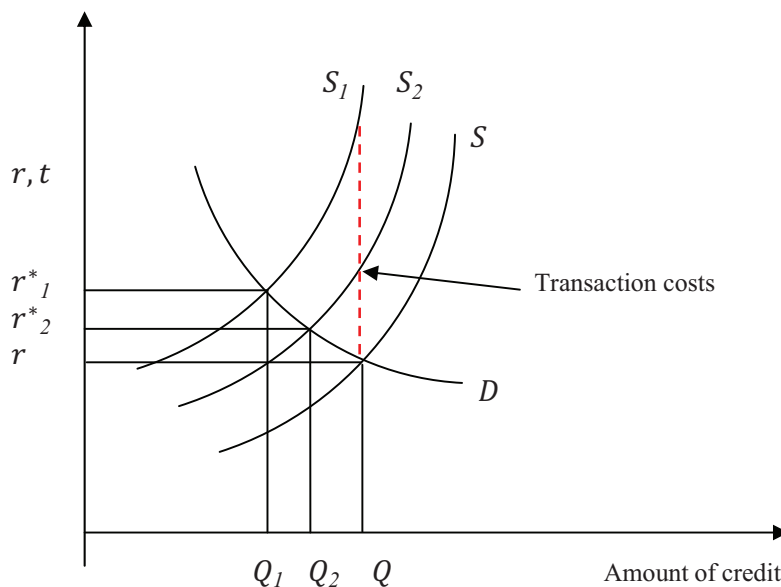
Financial system consists of a variety of institutions. Those institutions can be divided into two types: formal and informal; the formal institutions include all institutions that work under and are regulated by the government/central banks that probably include commercial banks, development banks, agricultural banks, cooperative finance, insurance institutions, leasing companies etc. The second type of financial institutions are informal that fall outside the government or central banks' regulation system that normally include friends, family members, saving associations, moneylenders, traders etc. Both formal and informal financial institutions have a common role to fulfill the intermediation role. Both types of institutions are important instruments that bring supplies of funds together with those who demand finance.

The credit availability theory focuses on how a government through financial institutions induces banks to make more or fewer loans available on easier or more restrictive term. These changes in credit availability have a direct effect on economic activities: if credit is more available, firms will undertake more investment and consumers may buy more goods, particularly durable goods.

In credit availability theory, interest rate plays an important role to increase lending rate and investment. However, other costs also influence the supply and demand of credit and therefore equilibrium in credit market such as transaction costs.

2.4.2 Credit and transaction costs

The intermediaries such as banks must charge the cost of borrowing and other costs that are related to bank management and the costs that are related to the borrowers such as traveling costs¹⁰. The discussion focuses here on the transaction costs, which means in this example any additional costs that do not include interest rates. Graph (2-9) if the bank or borrowers have additional cost (t) that will lead to shifting the curve S to S_1 . The vertical distance between this curve and the supply curve S is the amount of transaction costs for credit borrowers will pay r^*_1 . In the second period, for example, the bank reduces transaction costs¹¹, then the amount of lending increases from Q_1 to Q_2 . The lower the banks reduce the lending costs, the greater effect will be on the amount of lending to the borrowers. Graph (2-9) illustrates the supply and demand for credit with transaction costs.



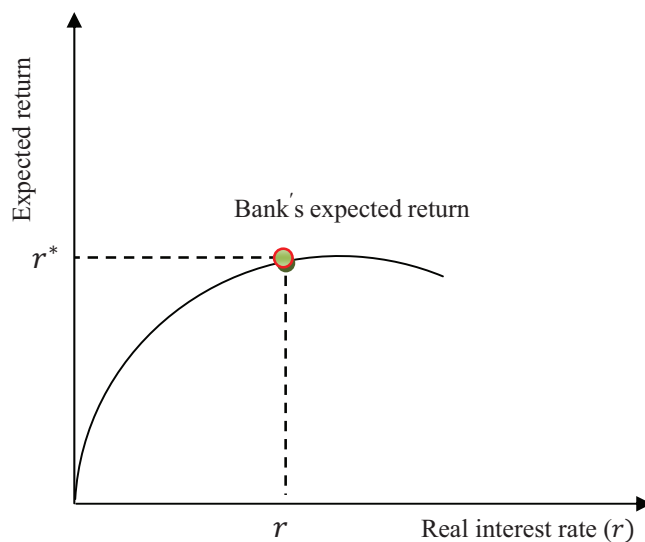
Graph 2-9: The supply and demand of credit with transaction costs.

Source: Heidhues and Schrieder (1999), p.6

¹⁰ Borrowers in rural area with poor communications may face higher transport costs and spend lots of time travelling to visit formal banks or other credit providers.

¹¹ The Grameen Bank of Bangladesh using mobile-banking approach, bank workers go to customers and not vice-versa, they go to small villages to reduce transactions cost such travelling costs. Borrowers can borrow and repay their loans in the village of their domicile.

However, if the bank charges very high interest rates or increases the transaction costs these may actually lower the expected return, because the higher interest rate or other costs will tend to drive away prudent borrowers who are careful in repayment. Graph (2-10); shows the bank's expected return is maximized at r^* , and charging a higher interest rate would reduce the bank's return. The expected return to the bank, which takes into account the increase rate of default, may actually decline as the interest rate charged by the bank increases beyond r^* . Therefore, the banks do not raise the rate of interest beyond r^* , even if there is excess demand for credit at that interest rate. They simply ration credit. The prevalence of credit rationing has serious implications for credit policy. Consider a situation where at r^* there is an excess demand for loans but banks do not respond by raising interest rate, since doing so would only reduce the expected return of the loan.



Graph 2-10: Interest rate and expected return.

Source: Stiglitz and Weiss (1981), p.394

However, if the lender raises the interest rate, the best borrowers, those most likely to repay their loans, will probably decide not to borrow. Moreover, those who do borrow attempt to offset the effect of higher interest by getting a higher return, but to do that, they must undertake greater risks. As a result, there is a greater chance that they will be unable to meet their commitments to repay. Increased interest rate has an adverse selection effect on the mix of those taking loans and an adverse effect on incentives from the bank's perspective. The impact of interest rates on adverse selection is discussed in the next section.

The bank's monetary policy has effects, not because of changing the real interest rates charged on loans, but because it leads to change in availability of credit. When the banks for instance tighten or loosen credit, with minimal changes in interest rate, they may nonetheless alter terms of credit contract. They may probably, increase their collateral requirements, the assets that borrowers have to put up when they take a loan and that will be forfeited in the event of a default. Higher collateral requirements both preclude some borrowers from borrowing those with insufficient collateral to get loans and make borrowing less attractive to the other borrowers, who acquire more losses. These factors just mentioned, might have impact on credit contracts and credit availability among poor households.

The change of monetary policy by banks or by government will have impact on availability of credit in the market and therefore will have a direct impact on credit market-equilibrium over all. In the next section, the discussion will focus on the nature of credit market and the factors that might lead to imperfect information on credit market and their impact on borrowers.

2.5 IMPERFECT INFORMATION IN CREDIT MARKETS

Credit market imperfection may characterize all credit markets, influencing the nature of financial contracts, raising the possibility of equilibrium with liquidity constrained. Information between lenders and borrowers in credit market has impact of credit contracts, ability of credit to match borrowers and lenders efficiently. Imperfect information plays an important role in credit markets and bank-credit maybe special, that is, have no close substitutes because of information advantages banks have in providing services and credit to business. Poor households in particular may have difficulty-obtaining funding from non-bank resources, so contraction in bank lending will force poor households not to invest or they contract their activities. Banks may also increase the interest rates charged, which will have direct impact on amount of credit, borrowers, however, may be limited in the amount they can borrow by the value of their assets that can serve as collateral. An increase of interest rate by lenders will lower the assets price that reduce the market value of borrows' collateral, for example if the lenders increase the interest rates by two times, that will lead to change in loan contracts and lenders require more assets as collateral from borrowers. So poor households that no more assets will not able to get credit at a new interest rates charged by lenders. This reduction of the value of collateral may then force firms and households to reduce investment spending as their ability to borrow declines.

The modern analysis of credit markets from the prospective of imperfect-information theory dates from Jaffee and Russell (1976), Stiglitz and Weiss (1981), these studies of credit rationing rely on imperfect information, although the exact mechanisms emphasized by different author studies adverse selection, moral hazard or monitoring costs have varied. These studies generally imply that in some circumstances the lenders expected profits would decline with an increase in the interest rate charged on the borrowers. Lenders will not raise interest rates on loans past the point at which expected profits start to decline even if there are borrowers who would be willing to borrow at higher interest rates. Building on this idea, Stiglitz and Weiss (1981) show that, in a world with imperfect information, the use of interest rates or collateral in the screening process introduce adverse selection and reduce the overall expected loan profitability. The theory of credit market imperfections, which are based on adverse selection, moral hazard, and monitoring cost is discussed in the next section.

2.5.1 Adverse selection

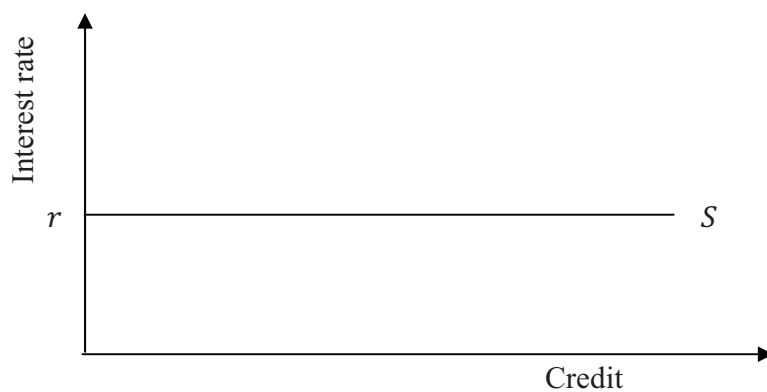
The basic discussion in this part focuses on how adverse selection as one face of imperfect information occurs in credit market and its impact on lenders and borrowers. If we suppose that formal banks are the main lenders in the markets and the expected return to the loan is function of interest rate and the probability of repayment. In this case the probability of loan repayment is depends on borrowers. However, in the credit-market not all the borrowers have the same probability of repayment. Some borrowers repay the loan in time and the whole loan and others may not and some of them might default. If the banks are able to distinguish between bad and good borrowers, they will charge each different interest rate and may ask different collateral that reflects different risks and market will clear without credit rationing, and market will be completely efficient. Jaffee and Russell (1976) analyze a credit-market model in which there are two types of borrowers', good-borrower ones who always repay and bad-borrowers ones who repay only if it is in their interest to do so. By assuming a distribution of default costs across the population of borrowers, Jaffee and Russell show that the fraction of borrowers who default is increasing in the loan amount.

In this section, the discussion focuses on how the adverse selection occurs in credit market. First, how an increase in the interest rate can increase the defaults among borrowers? Second, how equilibrium credit rationing can occur, i.e. how financial markets can settle on equilibrium where there are buyers willing to take out loans at the prevalent interest rate, but nobody willing to lend them money at that rate and the excess demand for loans is not resolved through rising interest rates?

If the bank as main lender in the market divides the borrowers into two types: The good-borrowers are called type G : this type repays loans with probability q_g . Type B : this type repays loans with probability of q_b . Where, q_g presents the good borrowers who are more likely to repay, and q_b presents bad borrowers who are more likely to default. Then the probability of repayments will be as following:

$q_g > q_b$, which means; good borrowers have larger probability of repayment than bad borrowers. In this case, if the banks can observe the type of borrowers they are lending to, they

will charge each a different interest rate to reflect difference in risk, and the market will clear without credit rationing. It will be fully efficient. For example, we assume the supply of credit is perfectly elastic “the supply curve for credit is horizontal” as shown in graph (2-11), assume also risk is neutral lenders, and that they lend to a large number of borrowers. The lender will charge $\frac{r}{q_g}$ to the good borrowers and $\frac{r}{q_b}$ to the bad borrowers, and will realize the expected return of each group will be r . In another way the lender receives $\frac{r}{q}$ with probability q so the expected amount is $q\left(\frac{r}{q}\right) = r$; this no credit rationing. When there is no credit rationing, the lenders charges risky borrowers more than good borrowers to compensate for the extra risk.



Graph 2-11: Credit supply perfectly elastic.

Source: Pakko (1999), p. 190

In the second case, if it is assumed that the banks are not able to observe the different types of borrowers, and the banks decide to increase the interest rate to get more profit. The fraction of bad borrowers in the loan applications pool also increases, so the probability of default goes up. This is the main point of the discussion, when the interest rate rises, the good borrowers drop out or in other words the good borrowers (self select out), leaving a greater fraction of risky borrower in market. This is a typical example of adverse selection that occurs in credit market.

However, one can also get equilibrium credit rationing with this as well. As r increases, the lenders increase, so an increase in r increases the profit. But the increase in r causes the fraction of bad borrowers to go up and this increases the default rate and lowers profit. So the net effect of an increase on r on profit depends upon which of these two effects is stronger, the increase in profit from charging a higher interest rate or decrease in profit from a higher defaults. Credit rationing occurs because the lender's profit function comes to the point where any further increase in r is not profitable, the loss from defaults increasing is larger than the profit increases from higher interest rate so the lender won't raise the interest rate even if there is an excess demand for loans at the current price charged in the marketplace.

The borrowers will default whenever the loan repayment amount exceeds the cost of default. If the banks wish to identify the quality of potential borrowers, they need to design two different loan contracts that are incentive compatible, so each one of them attracts different class of borrowers. In order to attract only the good borrowers, lenders need to design a contract that is appealing to this class of borrowers but unappealing to borrowers with bad investments.

However, the interest rate is not the only factor that characterizes loans. There are other parameters such as size of loan and collateral required etc. To look at other parameters mathematically, the example given by Walsh (2003) has been followed. Let suppose that the bank charges r_1 , loan size is represented by L and C is represents collateral required. The probability of loan repayment depends on the (risky) return yield by borrower's projects. If the project return is r , then the lender is repaid if:

$$L(1 + r_1) < r + C.$$

If $L(1 + r_1) > r + C$, the borrower defaults and lenders receive $r + C$. Now suppose the return r is r' risky that will give two probabilities of outcomes:

Return $r = r' + x$ with probability of $\frac{1}{2}$

Return $r = r' - x$ with probability of $\frac{1}{2}$

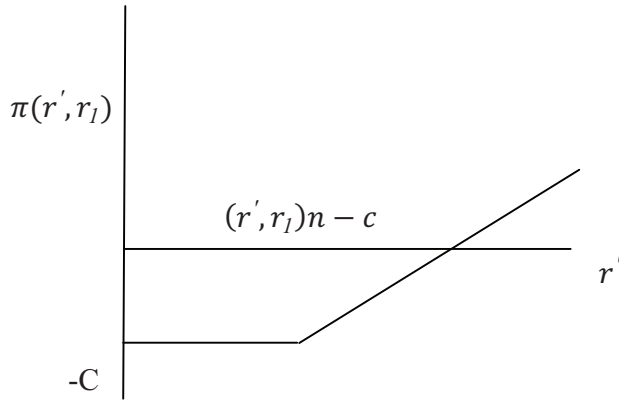
Then the expected return is r' , and the variance of return is x^2 . An increase in x represents a mean preserving spread in the return disturbance and corresponds to an increase in project's risk. Assume that $r' - x < (1 + r_l)L - C$, so that the borrower must default when that bad outcome occurs. If project pays off $r' + x$, the borrower receives $r' + x - (1 + r_l)L$; if bad outcome occurs the borrower receives $-C$, that is, any collateral is lost. The expected profit to the borrower is:

$$E\pi^B = \frac{1}{2}[r' + x - (1 + r_l)L] - \frac{1}{2}C. \quad (2.5.1.1)$$

Define

$$x^*(r_l, L, C) \equiv (1 + r_l)L + C - r'. \quad (2.5.1.2)$$

The expected profits for borrower are positive if all $x > x^*$. The critical cutoff value of x is increasing in r_l . Recall that increase in x imply an increase in the project's risk, as measured by the variance of returns. An increase in the loan rate r_l for example increases x^* , and this implies that borrowers with less risky investment will find it unprofitable to borrow if the loan rate rises, while borrow with riskier projects will still find it worthwhile to borrow. Because the borrower can lose no more than his collateral in the bad state, expected profits are convex function of project's return and therefore increase with an increase with risk (for constant mean return). For an example, if an individual borrows the amount " n " at the interest rate " r_l ", we say that individual defaults on his loan if $C + r' \leq n(1 + r_l)$. The net return to the borrower is: $\pi(r', r_l)$



Graph 2-12: Firm profits are convex function of the return on the project.

$$\pi(r', r_l) = \max(r' - (1 + r_l)n; -c)$$

Source: Stiglitz and Weiss (1981), p.396

On the other hand, while the expected return to the borrower such firms or households increases in risk, as measured by x ; the lender's return is decreasing in x . To see this point, note that lenders expected profit is:

$$E\pi^L = \frac{1}{2}[(1 + r_l)L] + \frac{1}{2}[C + r' - x] - (1 - r^t)L, \quad (2.5.1.3)$$

Where, r^t is the opportunity cost of funds to the lender? Now suppose there are two groups of borrowers, those with $x = x_g$ and those with $x = x_b$, with $x_g < x_b$. Type x_g have lower risk projects. From (2.5.1.1), if the loan rate r_l is low enough such that $x_b > x_g \geq x^*(r_l, L, C)$, then both types will find it profitable to borrow. If each type is equally likely, the lenders expected return is:

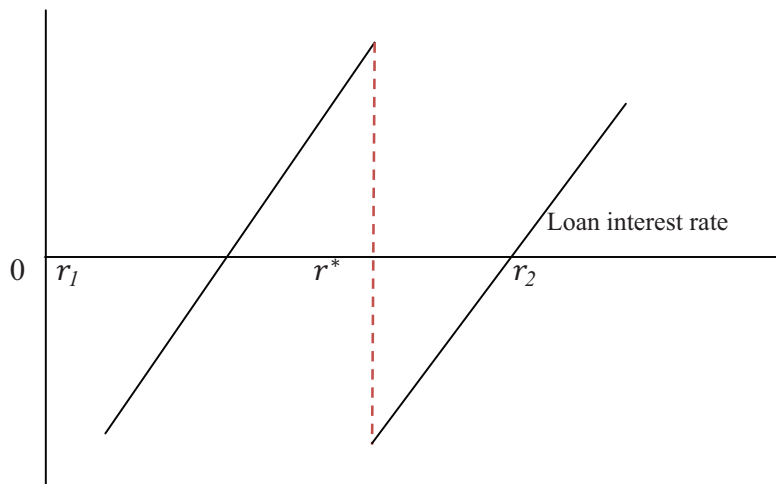
$$\begin{aligned} E\pi^L &= \frac{1}{4}[(1 + r_l)L + C + r' - x_g] + \frac{1}{4}[(1 + r_l)L + C + r' - x_b] - (1 - r^t)L \\ &= \frac{1}{2}[(1 + r_l)L + C + r'] - \frac{1}{4}(x_g + x_b) - (1 - r^t)L, \quad x^*(r_l, L, C) \leq x_g. \end{aligned} \quad (2.5.1.4)$$

Which is increasing in r_l . But as soon as r_l increases to the point where $x^*(r_l, L, C) = x_g$, any further increase causes all x_g types to stop borrowing. Only x_b will still find it profitable to borrow, and the lender's expected profit falls to:

$$E\pi^L = \frac{1}{2}[(1 + r_l)L + C + r'] - \frac{1}{2}x_b - (1 + r^t)L, \quad x_g \leq x^*(r_l, L, C) \leq x_b. \quad (2.5.1.5)$$

As a result, the lenders expected profit as a function of the loan rate is increasing for $x^*(r_l, L, C) \leq x_g$ and falls discretely at $1 + r_l = [x_g - C + r']/L$ as all low-risk types exit the market. This illustrated in graph (2-13), where r^* denote the loan rate that tips the composition of the pool of borrowers. For loan rate between 0 and r_l no loans are profitable and none will be made. For loan rates between r_l and r^* , both types of borrowers and the lenders expected profit is positive. Expected profits are again positive above r_2 , but in this region only x_b type borrow.

Lender's expected profit



Graph 2-13: Expected loan profit with adverse selection

Source: Walsh (2003), p.330

2.5.2 Moral hazard

When the borrower's behavior is influenced by the term of loan contract, moral hazard arises in credit market. Borrowers are different in terms of underlying riskiness of their investment, adverse selection occurs as the loan rate changes affect the borrowers. If borrowers can choose different projects or investments that have different risks and the lenders cannot monitor borrower's choice, a moral hazard problem arises. To illustrate such situation, study done by Walsh (2003), which is based on Stieglitz and Weiss (1981). He supposes borrowers can invest either in project A , which pays off R^a in the good state and 0 in the bad state, or in project B , which pays off $R^b > R^a$ in the good state and 0 in the bad state. Suppose the probability of success for project A is p^a and p^b for project B , with $p^a > p^b$. The project B is riskier project. Assume also the expected payoff from A is higher. $p^a R^a > p^b R^b$. By investing in project A , the expected return from project A is:

$$E\pi^A = p^a [R^a - (1 + r_l)L] - (1 - p^a)C, \quad (2.5.2.1)$$

Where, the borrower loses collateral C if the project fails. The expected return from project B is:

$$E\pi^B = p^b [R^b - (1 + r_l)L] - (1 - p^b)C, \quad (2.5.2.2)$$

The expected returns on the two projects depend on the interest rate on the loan r_l . It is straightforward to show that:

$$E\pi^A > E\pi^B$$

If and only if:
$$\frac{p^a R^a - p^b R^b}{p^a - p^b} > (1 + r_l) - C. \quad (2.5.2.3)$$

The left side of this condition is independent from loan rate, but the right side is increasing in r_l . Define r_l^* as the loan rate at which the expected returns to the borrower from the two projects are equal. This occurs when:

$$(1 + r_l^*)L - C = \frac{p^a R^a - p^b R^b}{p^a - p^b} \quad (2.5.2.4)$$

For loan rate less than r_l^* , the borrower will prefer to invest on project A; for loan rate above r_l^* , the riskier project B is preferred. The expected payment to the lender, therefore, will be $p^a(1 + r_l)L + (1 - p^a)C$ if $r_l < r_l^*$ and $p^b(1 + r_l)L + (1 - p^b)C$ for $r_l > r_l^*$. Since

$$p^a(1 + r_l^*)L + (1 - p^a)C > p^b(1 + r_l^*)L + (1 - p^b)C, \quad (2.5.2.5)$$

The lender's profit fall as the loan rate rises above r^* . This also leads the possibility of credit rationing that may characterize the loan market's equilibrium.

In general, the lenders such as banks cannot distinguish different risk types perfectly, they cannot screen borrowers perfectly and some institutions even not care about screening cost. The banks in some situations are not able to value collateral independently from future return, which are uncertain and depend on the risk of an investment. In the next section, the discussion will focus on the monitoring cost in credit market.

2.5.3 Monitoring cost

In the previous sections, the discussion was about how imperfect information might lead to adverse selection and moral hazard in credit market, which could lead to credit rationing as equilibrium in the market. In this section, the discussion focuses on how credit rationing might occur even in absences of adverse selection and moral hazard. The discussion focuses on loan contracts at fixed market rate, and how credit rationing rises if the lenders must incur costs to monitoring borrowers.

Contracts offered in the market are normally evaluated by lenders in term of expected return they offer. The expected return as mentioned in the previous section plays important role in the price in credit market. To determine the form of the contract at given expected return that is optimal to borrowers and lenders, first the contract must provide monitoring at least in some cases, otherwise the borrowers would maximize consumption by claiming the return on their project to be zero, no matter what the true return is. Therefore, the contract must specify in what cases monitoring occurs, and what payment occurs to the lenders is to be, if the monitoring occurs.

To see the optimal contracts and equilibrium in case monitoring cost, the example that is written by Walsh (2003) has been followed. Walsh assumed the two types of agents in market to be borrowers and lenders. Each lender takes r_l as given and offers contracts to the borrowers that yield, to the lender, an expected return of r' . Walsh in his example, which is based on Williamson (1987), assumes there are two periods. In the period 1, lenders offer contracts to the borrowers who have access to a risky investment project that yields to a payoff in period 2 of $x \in [0, \bar{x}]$.¹² The return of x is a random variable, drawn from distributions known to both borrowers and lenders. The actual realization is observed costless by the borrower; the lender can observe it by first paying a cost of c . This assumption captures the idea that borrowers are likely to have better information about their own projects than do lenders. Lenders can obtain this information by monitoring the project, but such monitoring is costly.

In the period 2, after observing x , the borrower reports the project outcome to the lenders. Let the report be denoted by x^2 . While x^2 must be $[0, \bar{x}]$, it need not equal the true x , since the

¹² x Must be between 0 and \bar{x} , and might take one of these two values.

borrower will have an incentive to miss-report if doing so is in the borrower's own interest. Let suppose also that projects require an initial resource investment of 1 unit and the borrowers have access to an investment project, which means that borrowers have no resource, so the investment they must obtain from resource which comes from lenders. Suppose that cost occurs whenever $x^2 \in S \subset [0, \bar{x}]$. Otherwise, the lender does not monitor. Denote by $R(x)$ the payment from the borrower to the lender if $x^s \in S$ and monitoring take place. Because the monitors and therefore observers x , the repayment can be made a function of actual x . The return to the lender net of monitoring costs is $R(x) - c$. If the reported value $x^s \notin S$, then monitoring occurs, and the borrower pays $K(x^s)$ to the lender. In this case, the return to the lender is simply $K(x^s)$. The borrower will report the value that results in the smallest payment to the lender; hence the monitoring does not occur, the payment to the lender must be equal to the constant, which is denoted by \bar{K} . Since all loans are for 1 unit, $\bar{K} - 1$ is the interest rate on the loan when $x^s \notin S$. If the report signal is in S^{13} , then monitoring occurs so that the lender can learn the true value of x . The borrower will report a x^s in S only if it is in her best interest, reporting $X^2 \in S$ must be incentive compatible. For this to be the case, the net return to the borrower when $x^2 \in S$, equal to $x - R(x)$, must exceed the return from reporting a signal not in S , $x - \bar{K}$. That is incentive compatibility requires that:

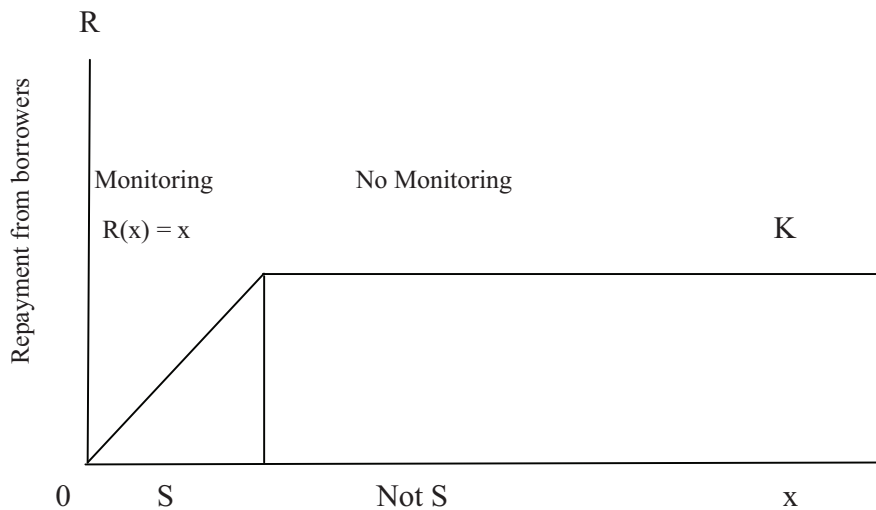
$$x - R(x) > x - \bar{K} \quad \text{or} \quad \bar{K} > R(x) \quad \text{for all} \quad x^2 \in S$$

The borrower will report a signal that leads to monitoring only if $R(x) < \bar{K}$ and will report a signal not in S , so that no monitoring occurs if $R(x) \geq \bar{K}$.

The optimal contract is a payment schedule $R(x)$ and the value of \bar{K} that maximizes the borrower's expected return, subject to the constraint that lender's expected return be at least equal to her opportunity cost r_l .

¹³ S means that if the repayment from borrowers is less than "regular constant repayment" that is denoted by \bar{K} , monitoring will take place. Not S means if the repayment from borrowers is exactly equal to the regular constant repayment that denoted by \bar{K} , monitoring will not take place.

The presence of monitoring costs can account for both the general form of loan contract in which monitoring occurs only when the borrower defaults- in which case the lender takes over the entire project's return and for rationing to rise in some equilibrium. To see the mentoring cost graphically, in absence of adverse selection and moral hazard, graph 2-14 illustrates monitoring cost in credit market and when it might occur.



Graph 2-14: Monitoring cost and efficient debt contract.

Source: Modified from Stiglitz and Weiss (1981), p. 407

In all three concepts that are related to imperfect information such as adverse selection, moral hazard and monitoring cost) have impact on loan contracts, interest rates and collaterals required by lenders. Therefore will affect in the investment in each sector particularly agricultural sector, where the majority of people living in rural areas are poor and imperfect information is a real issue in credit market.

Chapter 3

3 LITERATURE SURVEY

In the last two decades, numerous studies have focused to understand the workings of financial institutions in the developing countries. The studies have revealed, that world's poor, which include small-scale producers such as farmers, shopkeepers, weavers, small commodity producers, micro-entrepreneurs and traders require access to financial institutions that offer credit for obtaining working capital, maintaining assets, or expanding business. Access to credit through financial institutions has an impact on income, poverty alleviation and therefore the standard of living of poor households.

Access to credit affects small-scale producers through alleviating capital constraints particularly for poor households that depend on agriculture. The inputs of agriculture for example must be incurred during the planting, the growth periods of crops and for buying of animal feeds during the drought years, while the returns are received only after several months later and sometimes take several years. Therefore, credit is one of the most important instruments that finance the inputs of agriculture. A study done by Diagne et al (2000) focused on the feature of rural credit market. He reported that access is easier for some groups than for others that makes providing financial services a major issue, particularly in rural-areas.

This chapter provides a literature review on access to credit and credit constraints, which impact on credit applications and the amount of credit received by poor households. In additional details are given on the definition of each concept and analyses of the relations between household characteristics, and these concepts. Furthermore, the literature review discusses the theoretical background of each concept; the methods used for measuring these concepts and the difference between them. The determinations of access, and of applying for credit in rural areas, describe the relations between the individual's in a rural household and the financial institutions, which give an overview on rural credit market in general.

3.1 ACCESS TO THE CREDIT MARKETS

Access and taking credit are often confused. The main difference as the following: Access to credit describes the ability of households to borrow credit. The ability to borrow depends on different factors, which include household's social-economic characteristics, as well as farm and institutional characteristics. On the other hand, the term participation in credit indicates that households are free to take credit or not. Some households have access, but they do not like to take credit from market.

Access to rural credit market in LDCs is one of the important indicators, affecting the household's welfare. Diagne and Zeller (2001) in their study reported that rural households lacking adequate access to credit, believed to have negative consequences in technology adoption, agricultural productivity, food security, nutrition, health, education and overall welfare of households. Binswanger (1995); Jaffee et al. (1990) and Leathers (1990) reported that credit is an important instrument for improving the welfare of rural household's directly by reducing their vulnerability of short-term income shocks".

The majority of the developing countries has set up different credit programs and trying to improve the access to rural credit markets, by establishing agricultural banks that provide credit programs at subsidized interest rates. However, some of these banks are successful in achieving their objects of serving the poor and maintaining their financial sustainability, whereas other such banks have failed to reach their goals. These failures make rural households face credit constraints, and rely on the other banks or the private sector and borrow at a higher interest rate. Studies done by Adams et al (1984); Braveman et al (1986) and Adams et al. (1985) reported that the majority of financial institutions, particularly the so called ABs or ADBs that are established to support farmers and rural households and provide credit at subsidized interest rates, have failed to achieve their objectives to serve the rural poor and to be sustainable credit institutions.

3.2 CREDIT CONSTRAINTS

In the literature, different approaches are used to measure credit constraints. Barham et.al. (1996) in their study classified households as fully credit constrained if they applied for credit and their applications were rejected or if they did not apply because of insufficient collateral or too high transaction cost of the loan or because of fear of loss of wealth. Diagne et al.(2000) classified households that have at least one of their members (member over 17 years old) facing a binding credit limit as credit constrained and the borrowers that indicated a desire for more credit at the going interest rate or that did not borrow because they could not obtain credit also as credit constrained. Jappelli, (1990), defined those households as credit constrained which are turned down by a lender or have not been able to get as much credit as they applied for in the past few years.”

Avery (1981) and Stiglitz et al. (1981) found poor people face limits on the overall amount they can borrow from any given source, regardless the amount of collateral they are willing to put-up to back the loan as well as the interest rate they are willing to pay. Both these two factors created a lack of effective contract enforcement mechanism. Lenders have an incentive to restrict the supply of credit, even if they have more than enough money to meet a given demand and even if the borrower is willing to pay a higher interest rate.

The main difference between access to credit and credit constraint is that households that have no access to credit are not able to borrow because they do not have enough collateral or because of distance to banks i.e. all factors that are related to borrowers side that affect the ability of accessing to the credit market. Credit constraint is mainly related to the supply side i.e. sometimes lenders are not going to lend even at higher interest rates or might restrict the amount of credit that they lend. These assessments and decision depend on the lender. Both demand and supply of credit might lead to credit constraints in term of access and amount of credit received. For example, applications of borrowers who have not enough collateral might be rejected or the bank might restrict the amount of credit and therefore cause the borrower face a credit constraint.

3.3 MEASURING ACCESS TO CREDIT AND CREDIT CONSTRAINTS

There are two main approaches measuring access to credit and credit constraints in the literature. The first approach relies on an indirect method that detects credit constraints through violation of the permanent income hypothesis. The second method is a direct one and based on a direct questioning of household. These two methods are discussed in this section.

3.3.1 Indirect method

The indirect method is used by Hall (1978), and Deaton (1992). Both use the violation of the life-cycle permanent income hypothesis (LCPIH) for detecting a credit constraint through. This method means that in the absence of liquidity and borrowing constraints, transitory income shocks should not affect consumption. The hypothesis uses household consumption and income data to look for any significant dependence of consumption on transitory income. This approach is inconclusive. Using LCPIH-method and testing for such dependence requires sufficient observations of the same household. However, most of the studies rely on relatively short time series of panel data. The other disadvantage of employing this method is the condition of uncertainty. Violation of the implications of LCPIH can result in precautionary behavior even if the household is not under credit constraint where is impossible to disentangle the effect of a credit constraint and precautionary behavior from the type of income. Deaton (1992) discussed other disadvantage of using this approach. He mentioned that credit constrained households is still able to consume smoothly with precautionary saving and thus does not violate any implication of LCPIH. This method is useful for this small number of households that provides correct information about their income in each survey. However, it might not be suitable in large sample studies, because households might not forward correct information about their income and, therefore, the direct method is appropriate for large samples that are interviewed only at one time, i.e. this method is suitable for cross-section data surveys.

3.3.2 Direct method

The direct method is asking directly the household whether they are credit constrained or not. Collecting information from household members on their taking credit from credit market, this method depends on several qualitative questions. This concerns direct information about loan applications and households' that take credit. The method classifies them as credit constraint or not. By using this information collected directly from the individuals' one should not overlook the disadvantage of this method. It is still incapable of providing information how sever the credit constraint is. The approach is provides qualitative information in the sense that households are classified as either credit constrained or not. Nevertheless, as mentioned above the method also has its shortcomings. It relies on accurate information about the households' income and consumption, a condition which is not easy to be fulfilled because it requires repeated measurements on the same households.

This study is employs the direct method, using a household survey. The data were collected in Libya during the field research. They finding out whether households are able to have access to credit or not and whether they are credit constrained or not. The survey was designed for using the second method. The information collected through questioning is based on household's experiences of rejection and the need for credit.

In this study the amount of credit received is used to identify whether households are credit constrained or not. A sub-sample of all households includes those that have applied for credit. Rejected applicants did not receive any amount of credit; in other words the amount of credit received by rejected applicants is zero. Those households which applied for credit successfully will receive an amount of credit greater than zero. However, households-social-economic characteristics' may also play an important role in the classifications of constrained or unconstrained households.

3.4 FACTORS AFFECTING ACCESS TO CREDIT AND CREDIT APPLICATIONS

The factors affecting access and credit applications in the rural areas can be divided into two categories: the attribute of financial institutions, which affect the supply-side and individual household characteristics, which affect the demand-side.

3.4.1 Attribute of financial institutions

Availability of financial institutions can be an important determinant of access to credit and credit applications in rural areas. The more financial institutions are available to households, the more likely is access to credit and therefore investment with a positive impact on overall households' welfare. Distance to financial institutions is another factor that might impact on access to and credit applications. Household in rural areas might face other costs such as traveling cost to get information on credit that offered by banks. In addition, households in rural areas might travel several time to get credit and to repay back the credit plus interest rate charged.

Financial institutions offer different types of credit. Short or seasonal credit that offered by agricultural banks to cover the production inputs during each season, this type of credit might not offered by other banks such commercial banks. This might lead household to apply for agricultural bank credits rather than other banks.

The repayment period is another important factor that has impacts on access to and credit applications. A household that depends on agricultural activities might need long repayment period to pay back credit, because of long production cycle in agricultural comparing with other sector like industrial sector. Therefore, households might prefer a long repayment period that offered by some banks.

Other factors, which is related to service of banks have also impact on access to credit and credit applications. The Grameen Bank of Bangladesh for example is using mobile banking approach; household in rural areas can borrow and repay back their loans in the same village and did need to travel to bank. The mobile lending approach is reducing any additional costs that household might face .This approach also have high repayment rates comparing with other approaches.

In the case of agricultural and non-agricultural banks, the price for saving/credit is the interest rate charge. Like any other products or services the demand for credit is likely to be affected by its own pricing. In the case of Islamic countries, the price of credit (interest rate) charged or offered, has two effects:

Firstly, the Islamic Religion prohibits financial institutions to charge or offer an interest rate. This might have a very negative impact on access to credit and credit applications in these countries. Charging interest rates in the Islamic countries such as Libya will have a negative impact on access to credit and on participation in credit programs of individuals. If a bank charges or offers interest rate on credits, it is more likely that it will have low access of and low applicants by individuals, even those who have liquidity constraints, which in turn will have negative effects on production, technology adoption and overall households' welfare.

The second impact of an interest rate charged or offered depends on the level of the interest rate since it is an important factor in determining access to credit and eligibility for credit by individuals. The higher the interest rate charged is the lower is access to credit with fewer applicants for credit. Higher interest rates will also impact on investment and economic activities; because the returns from an activity must be high enough to enable the investor to retain a profit after paying the interest rate and equity for the loan. In addition, a higher interest rate affect negatively the demand for credit which leads to only limited borrowers with high risk projects may have their demand satisfied. The impact of a higher interest rate that leads to adverse selection and a higher default rate was discussed in chapter two.

3.4.2 Household characteristics and demand for credit

Some studies identified household characteristics that have important implications for access to and applications for credit in rural areas. To those belong to the age of household head, level of income, number of family members in the household who are employed, gender, education and marital status. Other factors such as household assets, livestock holding, and farm characteristics in terms of farm size, size of cultivation, soil type and irrigation system, etc are also of importance.

The age of an individual in the household members is to be taken into account, because young people are considered to be more active in terms of earning higher income and of saving for accumulating wealth. Zeller (1994) found age to be positively affecting the decision to access and demand for credit. Therefore, a young person may tend to save and may borrow more for investment, while an old one maybe less inclined to do so. In addition, the young may also tend more to invest in off-farm activities, which require large capital outlay, while old and retired household members are more likely to invest in farm activities. The age of the households has been estimated to have a positive impact on access to and applications for credit. This might be related to experience of production.

The gender of the household head also affects access to and application for credit. Gender is correlated with the social role in society. This is completely different in Arabian culture, where women usually do not have control of assets such as land and buildings that could be used as collateral. Therefore, access to and application for credit probably will be different between men and women. This difference between men and women is the reason who one considers gender as a determinant. Otherwise one can neglect this character as a factor.

Family size is also correlated with age of the household head. A large size usually implies that more members of the family have permanent income and this probably increases with the ages of the household head.

As regards to education individuals that have more years of education are likely to have a higher income and more savings. It is also likely that they have assets, which can be used in production and as collateral. Household heads with more years of education are considered to be better able to exploit investment opportunities when they arise and generate higher income in the future. Therefore, the demand for production funds is likely to increase with education of the household head. Education levels of member of family who live in the same household are considered to have impact on access to and application for credit. The more educated members in the family are the more likely is it that they engage in economic activities and reach higher earnings, which might function as an incentive to invest in different economic activities. On the other hand a lower level of education of the family members impacts negatively the opportunity to access, participation and application for credit.

Economic factors are very important in influencing access to credit and applications for credit. The level of income for example, is relevant for determining access to and application for credit. At higher income households are able to save more and hence acquire more assets which can be used as collateral for receiving loans. In addition, more as family member are employed there is also the chance of owning more assets and, as a consequence being engaged in more economic activities. Household with low income have limited resource for saving and for demanding credit.

Other economic factors such as livestock holding can also play important role to determine access and credit applications among rural-households. Diagne (1997) found, that the shares of land and livestock in the total value of household assets are negatively correlated with access to formal credit. This means which households that have sufficient assets such as livestock prefer to depend on own assets for investment rather than borrowing from banks, particularly when banks offer credit at high interest rates. According to Diagne and Zeller (2001) land size is a very important factor determining access to credit. Households characterized by holdings of less than 1 hectare and with very low crop yield are so severely constrained by land that they did not benefit from any kind of access to credit. Total farm size and how much of land is cultivated might be lead to higher demand for credit because the more hectares the farmer owns and cultivates is considered as proxy for collateral and associated with better repayment capacity.

Farmers who have permanent water supply at their farms during the entire year are considered to have a better chance of access to and application for credit because they can engage in agricultural and related activities during the production seasons while other farmers that depend only on rainfall are considered to have less agricultural activities and therefore less access to credit and do not participate in credit programs. Water availability is particularly important in Libya because of the dry weather during most parts of the year with no rainfall at all in the middle and the southern regions of the country and of low average rainfall in general.

Analyzing the failures of credit programs in the Libyan rural areas and the successes of other programs require an understanding of the ways which enable some rural-households are able to have access to and apply for credit and others not, therefore the decision to borrow from formal banks depends on other factors. In this study, the impact of factors that affect the decision of borrowing among households is investigated.

Chapter 4

4. DATA AND METHODS

In this section the methods used in this study are described. This includes those for collecting the data and a description of the regions from which they were taken, a detailed explanation of the sample design etc. An overview of how large and important is the microfinance in the Libyan agricultural sector will be obtained by estimating access to credit, credit applications and the amount of credit received among the successful credit applicants. Empirical investigations of these facts using econometric methods will provide an overview of rural-credit markets in Libya and the role of agricultural banks and the commercial banks play in these markets. The analysis will focus on the relation between rural- households and formal lenders.

4.1 STUDY METHODS

Primary data used in the analysis were collected through a household survey (RHS). The data asked to cover socio-economic characteristics of rural households, their access to and applications for credit, the amount of credit received and credit constraints. Based on econometric models factors are determined the impact on these four topics related to credit.

The first step, the analysis determines whether households in the Libyan rural area are able to take credit or not. If the head of household is able to take credit from formal lenders; i.e. (answer of the question in the survey is “yes”), then the possible outcome will 1 or 0. The dependent variable has two possible outcomes. The limited dependent variable such as discrete choice models have been used by several studies for decades. The models, which is used in this study as following:

4.1.1 Probit model

In dummy regression variable models, it assumed that the dependent variable is quantitative whereas the explanatory variables are either quantitative or qualitative. In this type of regression models the dependent variable is dichotomous in the nature taken a 1 or 0 value. In this study, in order to explain the behavior of dichotomous dependent variables a Probit model is used. The model is used to determine the probability of access to credit. The model dealing with categorical dependent variables in this study. Probit regression is an alternative log-linear approach to handling

categorical dependent variables. Its assumptions are consistent with having a categorical dependent variable assumed to be a proxy for a true underlying continuous normal distribution. In order to explain the behavior of dichotomous dependent variable suitability chosen cumulative distribution function (CDF). The CDF can be derived more generally from underlying latent variable model. This will be discussed in chapter six.

4.1.2 Bivariate probit model

The second step, in the analysis is to determinate the impacts on the ability of access to and credit applications. In this model, there are two binary depends variables. Let's say y_1 and y_2 and to model them jointly as a function of some explanatory variables a Bivariate Probit-model is employed. With this the causes of the ability of access to and application for credit are simultaneously identified. The model will determine the factors that increase or decrease the probability of apply for credit among households. This model includes households that able to take credit and households that applied for credit. Some households that able to take credit but did not apply for credit, maybe they did need credit or lack of collateral, etc. Bivarite probit model is used to determine factors that have impact on the probability of access and credit applications. In some situation, a binary outcome is observed only for specific part of sample. The idea that factors affecting selection into the sample may affect the binary outcome, using Bivarite probit model and sample selection models are well known by Ven and Praag (1981) and Heckman (1979).The model is discussed in details in chapter seven.

4.1.3 Multiple regression model

The third step is a multiple regression analysis, which investigates the main factors determining the amount of credit received by households. Those factors are considered which have been mentioned above such as household's socio-economic characteristics, farm characteristics and institutional factors such as interest rates, repayment period, etc. Using multiple regression analysis to determinate what factors that might explaining the amount of credit variations among credit applicants. This model is used to predict one variable form one ore more other variable. Its predicts the factors that determinants the amount of credit received among credit applicants. Regression models provide the scientist with a powerful tool, allowing predictions about past, present, or future

events to be made with information about past or present events. The model is widely used in econometric analysis.

4.1.4 Logit model

The last model is a logit model; the model is employed to determine credit constraints among credit applicants. The model is used to predict the probability of credit constraint among households. Using logit model in this part of thesis, because the outcome of the model is taken 1 or 0, 1 if household face credit constrained and 0 if not. In this part of the thesis, is determining the factors that might increase or decrease the probability of facing credit access and amount constrained. The advantage of using logit model is to know exactly the impacts of each explanatory variable on the probability of credit constrained by calculating the marginal effects.

In this part of analysis, households are divided into two groups; credit access constrained households. The model considers those households that have applied for credit and their applications are rejected. These are credit access constrained households. Other households who applied for credit and their applications accepted are credit unconstrained households. Second group of households are called credit amount constrained households. The model used here to determine the factor that might lead to credit constraint in term of mount of credit received. Households who receive less amount of credit than the amount they applied for are considered credit amount constrained households. Other households who receive the same amount of credit they applied for are considered credit amount unconstrained households.

Figure (4-1) illustrates the general conceptual framework in this study. The figure also shows credit constrained might also rises among households who have no access to credit. Those households might face credit constraints in term of access, but they did not included of this study, because they need another survey to capture factors that might lead to them to face credit constrained. In addition, to captures all factors that need a long survey and this might ended with insufficient and inaccurate date set.

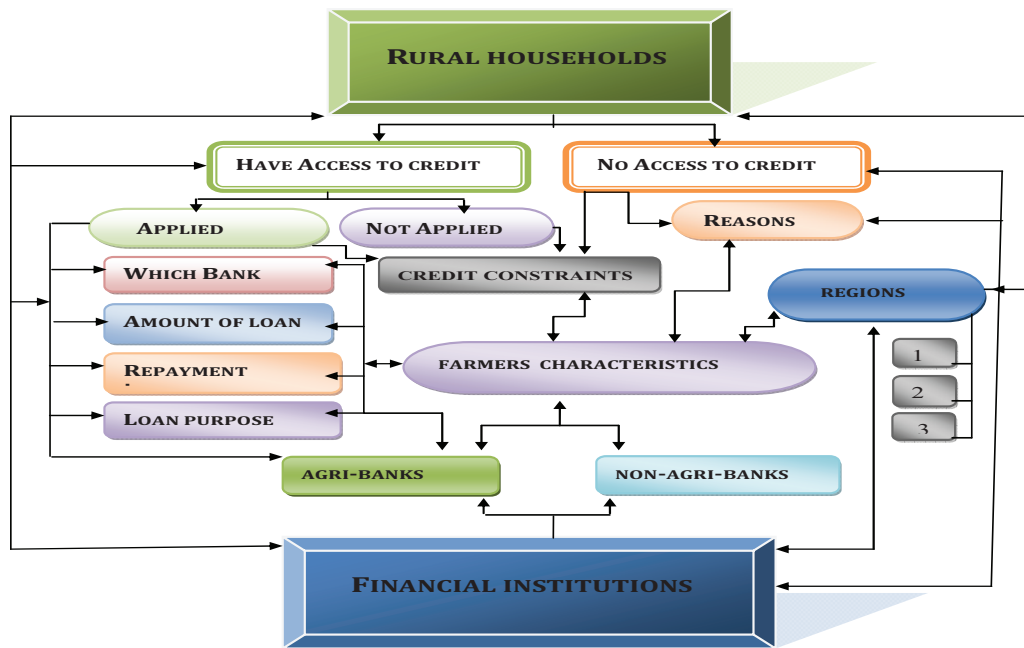


Figure 4-1: Conceptual framework

Source: Own design

4.2 SAMPLING DESIGN

Information on rural households' characteristics is needed to do the analysis and for saving time and costs. This information is often obtained by using of sample survey. The first step is taking simple random sample to choose the three regions of this study. Stratified random sample used in each region, where each region contains several villages, rural-households had similar interview. The data collected in each region is used as primary data in this study. Data is also collected from the Libyan Ministry of Agriculture (LMA), the Libyan Ministry of Planning (LMP), the Libyan Ministry of Economic (LME), Agricultural Center Bank (ACB), Libyan Central Bank (LCB) and the local authority in each region.

The optimal sample size in each region is computed as following; first, information from each region is collected by using the pilot survey which gives an overview on households' socio-economic, farm and institutional characteristics. Based on this data it is found that the standard deviation of assets held by households rather high. This variation might play an importance role of determining access to credit and credit application in rural area. Moreover, household assets are found in several papers as an important factor that determines access and credit applications among individuals. Household assets considered as important collateral form lenders as well.

In this study, the optimal sample size is estimated using household assets. To estimate the mean value (μ) of assets of all rural households in the three regions with 95% confidence; the sample estimate \bar{x} is employed in the following form;

$$P(|\bar{x} - \mu| \leq \varepsilon) \geq 95\%$$

The population size¹⁴, which depends on the information form the local authority in each region is approximately 30000 households, which is the sum of all three regions together. Before using the sample size calculator, there are two terms that we need to know. These are: confidence interval and confidence level. The confidence interval (also called margin of error) is the plus-or-minus figure usually reported in newspaper or television opinion poll results. The confidence

¹⁴ Population: means the total rural -households living in the three regions

interval here is 5.36. The percentage of households that own less than average assets or greater than the average assets is about 50% of sample in worst-cases.

The confidence level tells us how sure we can be. It is expressed as a percentage and represents how often the true percentage of the population who owned average assets lies within the confidence interval. The 95% confidence level means you can be 95% certain; the 99% confidence level means you can be 99% certain. Most researchers use the 95% confidence level.

If we put the confidence level and the confidence interval together, we can say that the 95% are sure the true percentage of the population is between $(50-5.36)$ 45% and $(50+5.36)$ 55% are around the household assets average.

To calculate the optimal sample size for known population 30000 households, with confidence interval 5.36, the optimal sample size calculated as following:

Sample Size:

$$ss = (Z)^2 * (p) * (1-p) / (c)^2,$$

Where:

Z = Z value (e.g. 1.96 for 95% confidence level)

p = percentage picking a choice, expressed as decimal

(.5 used for sample size needed)

c = confidence interval, expressed as decimal

(e.g., .05 = ± 5)

$$SS = (1.96)^2 * (0.5) * (1-0.5) / (0.05)^2 = 330$$

The total optimal sample size should be at least 330 households

However, each region has a different population size, so the next step is to proportionally distribute the total sample size to these regions as follows:

- The total rural-households living in region 1 is 13000
- The total rural-households living in region 2 is 11000
- The total rural-households living in region 3 is 6000

This leads to the optimal sample size for each region:

✓ Region 1;	$(330 \cdot 13000 / 30000) =$	143	} = 33
✓ Region 2;	$(330 \cdot 11000 / 30000) =$	121	
✓ Region 3;	$(330 \cdot 6000 / 30000) =$	66	

This stratified-random sample is used with respect to the total-rural households in each region. In region 1 the number of households interviewed is 143 households, 121 and 66 number of households interviewed in region 2 and region3, respectively. At least five villages in each region are included. Agricultural banks are existed in all three regions. The survey and presented in the interviews in Arabic to collect information on rural-households. To avoid problems during conducting the interviews, a pilot survey in each region was used.

4.3 RESEARCH LOCATIONS

Libya has total area of about 1.76 million km². About 95% of the country is desert. The climate conditions are influenced by the Mediterranean Sea to the north. The Mediterranean coastal strip has dry summers and relatively wet winter. In the southern inland part per-desert and desert climate condition prevail, with torrid temperatures and large thermal amplitudes. Rains are rare and irregular.

Climate change in Libya and this has a negative impact on the country's agricultural sector. The expert in climate change indicated that the Libyan authorities have, at early stage, been aware of the negative impacts of climate change on the environment particularly the gradual decrease in rainfall quantities and the increasing rarity of water sources, saying that in this context, the Libyan government has in place the MMRP, which construction started in 1984. This river is currently the most important hydraulic network in the northern part of the country, which included Misratah and Surt regions that selected in the survey.

In this study, the regions are randomly selected in first step and stratified random sample is used considering the size of each region. The data is collected from several villages in three different geographical regions. From the northern part of the country in which most agricultural activities take place and which is host to about 85% of Libya's population two regions were selected.

Misratah and Surt regions are located in the north part of the country. Both regions depend on rainfall during winter season, average rain fall is quite low, which about 200-250 mm per year. The government has provided water by MMRP to some cultivated farmers. But the majority of households in rural areas are still depends on rainfall in winter. Farmers during winter season are cultivating barley, wheat, dates, and they also keeping livestock.

The third region chosen is located in the southern part of the country Waddan. It represents different geographical areas where all households depend on ground water for irrigation, rainfall during is almost zero over the entire year and people are engaged in other agricultural activities in their farms producing mainly dates and livestock products. This region is dry during the entire year, rainfall is very rare. In fact, the desert is the region's most permanent natural features.

Rural household survey is used to collect the data during field research in years 2006 and 2007. The survey used in three different regions where in total 330 households were interviewed. In this study, region 1 represents Misratah, 2 represents Surt and region 3 represents Waddan.

Figure 4-2 illustrates research locations in this study.

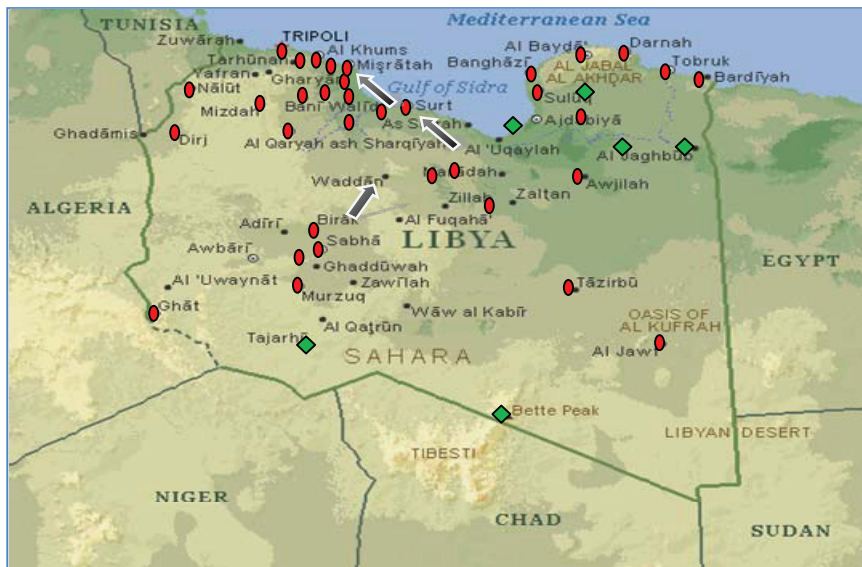


Figure 4-2: Map illustrates locations of agricultural banks and research areas.

- Agricultural bank branch,
- ◆ Agricultural bank office,
- ➔ Research Locations

Resource: Map adopted from Libyan atlas and the information is based on field research

Chapter 5

5. EMERGING PATTERNS IN THE RURAL CREDIT MARKET

This part of the study focuses on the statistical description of the main characteristics of households in the three regions. The discussion focuses on those aspects which are important for the analysis of this study; i.e. on the households' ability to access credit markets and to apply for credit. Other characteristics which probably have a significant impact on access to and applications for credit, the amount of credit received and credit constraints among rural households.

5.1 ACCESS TO CREDIT AMONG REGIONS

The distribution of borrowers in the data survey shows that around half of the rural households are not able to take credit from formal banks. The distribution is depending on survey questions on whether household have access to credit or not. If head of household is able to take credit from any formal lenders in survey his answer is (yes) if he isn't able to take credit, his answer the question (no). The discussion of the concept of the ability of access was in chapter three. This holds, for example, for region 2 Surt where more than half of the households are not able to access the credit market. There is a little variation among the regions in this respect. Figure (5-1) represents the distributions of number of households with and without access to credit. However, the factors affecting this ability to access might differ among the regions. To those belongs lack of collateral, low income, or farm size, soil quality, water availability for households that owned farm, etc. Also the formal lenders affect this ability through interest rates charged, types of credits offered etc.

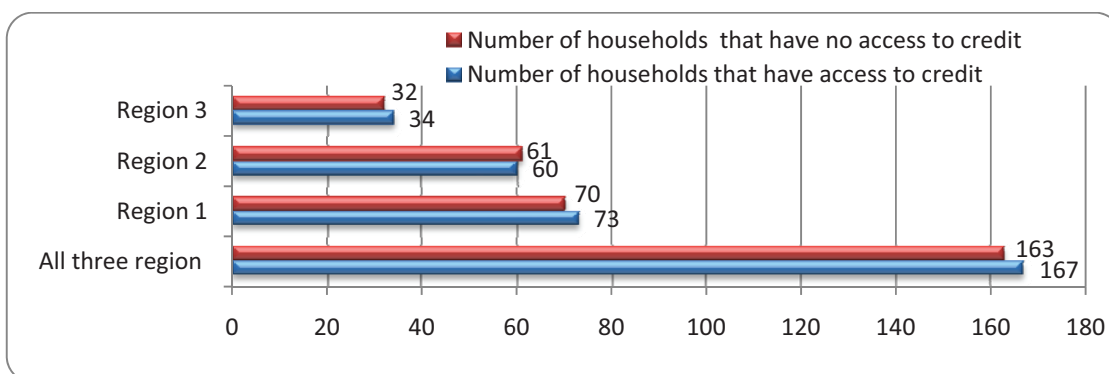


Figure 5-1: The distribution of number of households with and without access to credit (in number of households).

Source: Own data based on data of the rural household survey

Based on the RHS, the majority of the persons able to access credit markets are males. This asymmetric gender distribution is illustrated in Figure (5-2). This figure shows that among all households with access to credit in around 97% of them the household head is male and in only 3% female.

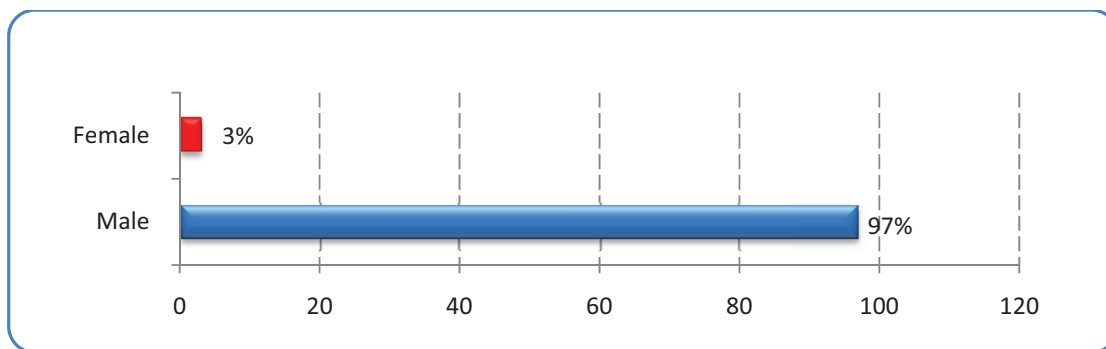


Figure 5-2: Access to credit distributed by head of households' gender (in %)

Source: Own calculation based on data of the rural household survey

In terms of head of household education and its impacts on the ability of access to credit, those households that are able to access to credit are higher on the average years of schooling compared to those that are not able to access to credit. The average years in schooling are about 7.8 years for households that have access and 6.3 years in schools to those that have no access.

Statistically, most of the households (83%) with have access to credit hold livestock at their farm and only 17% do not. This is depicted in figure (5-3). Livestock husbandry represents the largest income source. According to a report by Libyan Ministry of Agriculture (2006), which is represented the whole country, poultry and sheep reach the largest animal numbers (60 and 5.6 million, respectively). Of other animals lower numbers are husbandry (1.3 million goats, 140 and 160 thousands cattle and camels respectively).

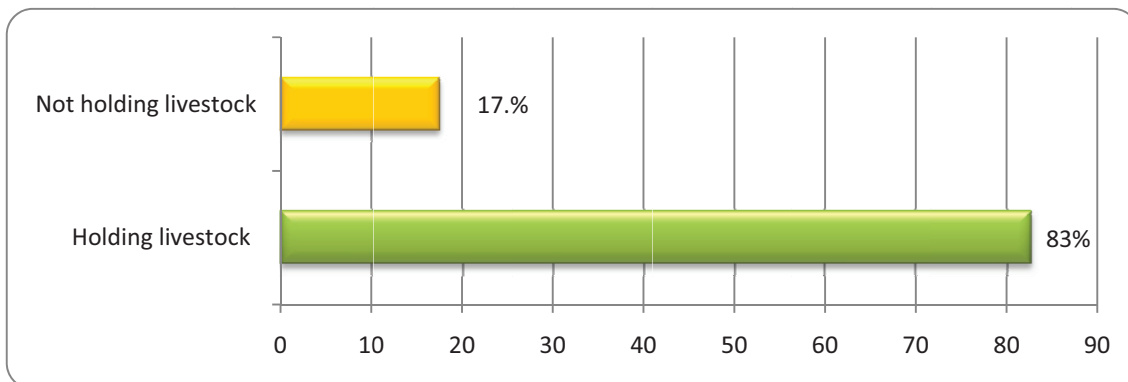


Figure 5-3: Access to credit distributed by livestock holding (in %).

Source: Own calculations based on data of the rural household survey.

The second economic factor that might influence access to credit is household assets. Statistically, households with access to credit own more assets on average (14244 LYD) compared to those that have no access to credit (8466 LYDs). Figure (5-4) illustrates this fact. Household assets are an important factor that determines access to credit because it enlarges the production potential and, hence, the ability to pay back loans. The other important aspect is that assets may function as collateral which is considered by lenders in case of loan default.

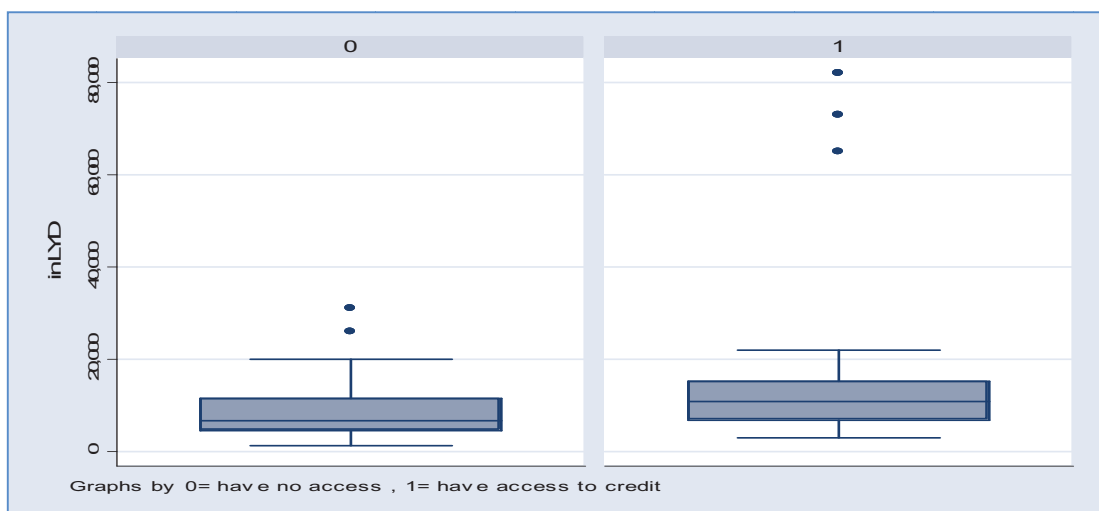


Figure 5-4: Households assets distributed by access to credit (in LYD).

Source: Own calculations based on data of the rural household survey.

5.2 CREDIT APPLICATIONS

Credit applications mean only households that have applied to formal lenders for receiving credit. It does not include those households that are able to get credit but did not apply for it for whatever reason; e.g. they did not need credit. In the previous section, it was shown that only 167 households (61% of all households surveyed) were able to have access to credit and only 103 of them (31% of all households surveyed) applied for credit. There might be several reasons for the low share of credit applications. Farmers may face difficulties in processing their loan applications, encounter restrictions and/or do not benefit from credit programs. The difficulties for farmers entering the credit market may be due to imperfect information as well as demand and supply forces. Inexperience in risk assessment, lack of collateral, low profitability of the agricultural sector and macroeconomic uncertainty make banks view farmers as high-risk credit applicants. Figure (5-5) represents the number of households that did and did not apply for credit.

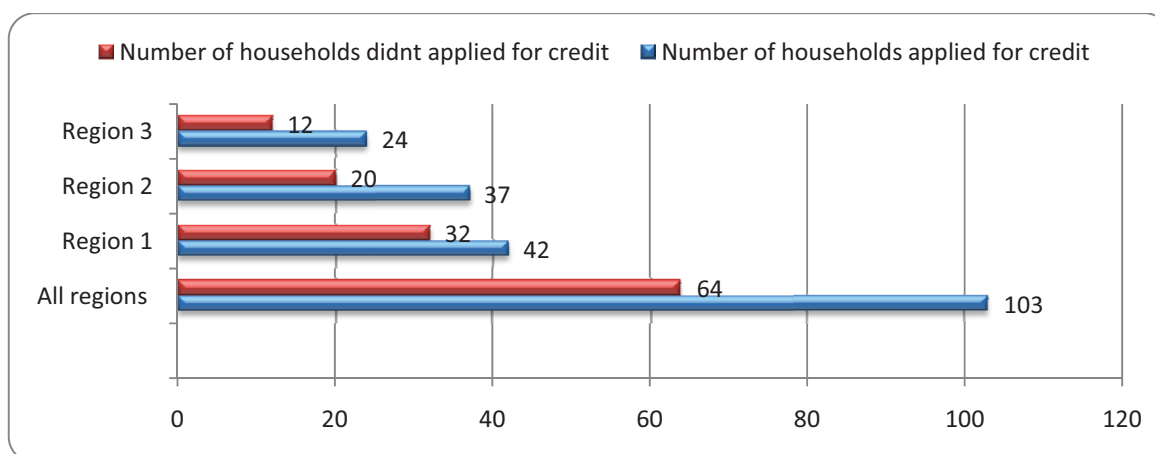


Figure 5-5: Number of households that applied and did not apply for credit (in number of households)

Source: Own data based on data of the rural household survey

Factors that might have impact on credit applications are discussed following the same method of descriptive analysis as above. First, the distributions of credit applications show that holding livestock and owning assets are widespread among credit applicants. 93% of households that applied for credit are hold livestock and only 7% are not holding livestock. They also own more assets compared to households that did not apply for credit. The average asset owned by credit applicant households is higher comparing with non-credit applicant households. Figures (5-6) and (5-7) show the distributions of these two characteristics of credit applicants, respectively.

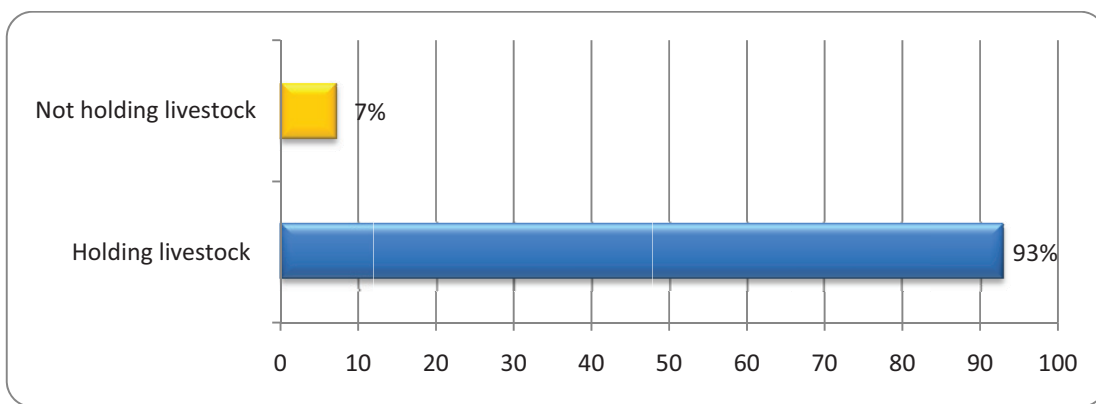


Figure 5-6: Livestock holding among farm households as regards to credit applications (in %).

Source: Own calculation based on data of the rural household survey.

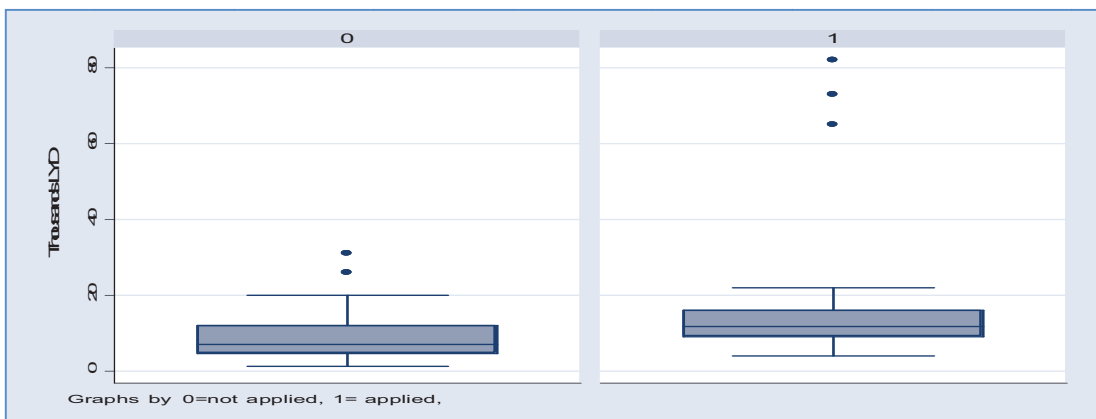


Figure 5-7: Amount of assets of farm households as regards to credit applications (in 1000 LYD).

Source: Own calculation based on data of the rural household survey

5.3 AMOUNT OF CREDIT RECEIVED

In the previous section, the discussion was about households' credit applications. Only 103 of the 167 farmers who had access to credit markets also applied for a loan. In this section, the discussion is on the amount of credit received by the successful applicants. The data shows that only 87 households out of the 103 applicants received a loan. For the remaining 16 applicants it was denied. Figure (5-8) depicts the number of applicants being successful and not in total and differentiated by region surveyed. The share of successful applicants among the total number varies slightly. While it is 85% for all three regions together and region 1 it is only 78% in region 2 and 96% in region 3. The formal banks have various lending programs such as for short, medium and long-term loans.

The data shows that more than 51.85% of the loans taken by households were for building houses, 33.3% buying production inputs, 9.8% for family needs and 4.9% for social events. Figure (5-9) illustrates the average amount of credit received in each region. As can be seen households in region 3 received the highest amount of credit on average compared to the other two regions. This region depends completely on ground water, which means people can invest on agriculture and livestock during the year. In addition, the ground water quality is quit good, comparing with two other regions where the ground water has higher degree of salinity small annual rainfall. Factors such as socio-economic characteristics of households, land or farm characteristics and those of the banks such as interest rate, type of credit offered and repayment period, will be used as potential variables for determining the amount of credit received. All these factors may have a significant influence on credit applications and amount of loan received in rural area. This will be explored in later chapters.

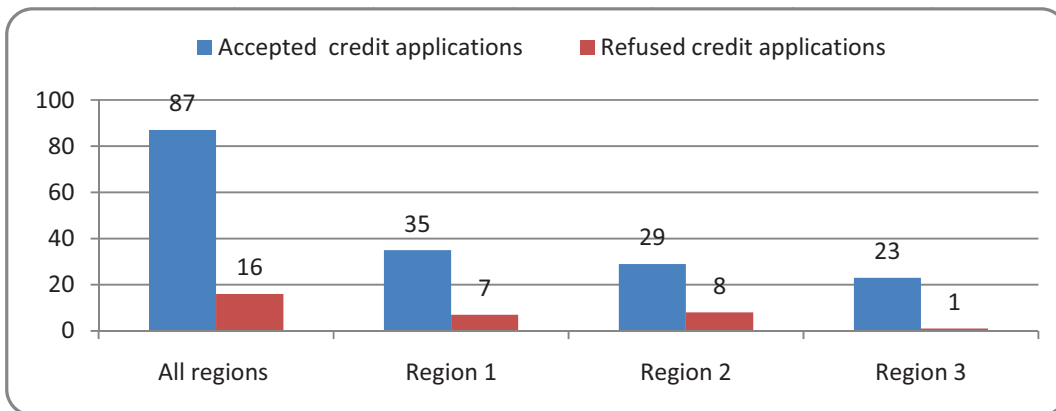


Figure 5-8: Number of households with accepted and denied credit applications (in number of households).

Source: Own calculation based on data of the rural household survey

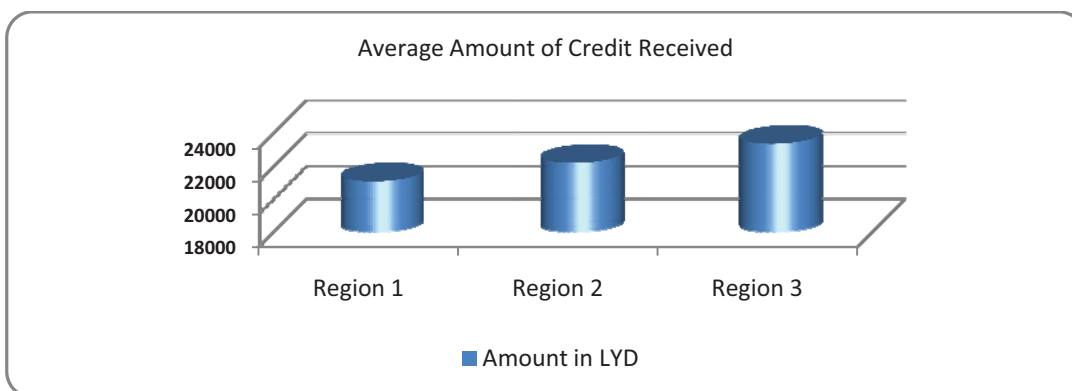


Figure 5-9: Average amount of credit received among regions (in LYD).

Source: Own calculation based on data of the rural household survey

5.4 HOUSEHOLD CREDIT CONSTRAINT

Households might face credit constraints in terms of access and the amount of credit given. In this study, rural households are divided into two groups.

The first group comprises all households that have applied for credit. They are subdivided into those whose applications were denied are called credit constrained. In the other subgroup are the households with a successful application, they are called the credit unconstrained.

The second subgroup is divided further. Those households which received an amount of credit less than they applied for are also called credit constrained. Those households that were granted an amount of credit equal to the one applied for are considered credit unconstrained. In summarizing the classification, the credit unconstrained households are the ones which applied and their applications are accepted and those applicants received the full amount asked for. The credit constrained households are the ones that applied for credit but their applications were turned down and those applicants who received less than what they applied for.

Next, the socio-economic characteristics of households which applied for credit and were denied it (constrained) or received it (unconstrained) are compared. Among the former applicants males are not as often household head, livestock husbandry is less frequent and they own fewer assets than among those whose application was successful. These credit constrained households have assets of around 10225 LYD (see Table 5-1). This is considerable lower than the 18253 LYD asset values held by unconstrained households. About 87% of denied applicants hold livestock but 93% of the accepted ones. In terms of gender of household heads the comparison between the two groups is: 7% of constrained applicants are females but all of successful applicants are males.

Table 5-1: Differences in socio-economic characteristics of credit access constrained and unconstrained households.

1. Credit constrained households						
Variables	Unit of measurement	Obs	Mean	Std. Dev.	Min	Max
Gender of household head	1 = male, 0=female	16	0.93	0.25	0	1
Level of education	Years	16	8.93	7.33	0	16
Livestock holding	1 =holding, 0= not	16	0.87	0.34	0	1
Households' assets	LYD	16	10225	5226.535	5000	19000
2. Credit unconstrained households						
Variables	Unit of measurement	Obs	Mean	Std. Dev.	Min	Max
Gender of household head	1 = male, 0=female	87	1	0	1	1
Level of education	Years	87	7.62	5.41	0	16
Livestock holding	Yes or No	87	0.93	0.25	0	1
Households' assets	LYD	87	18253.45	19397.6	4000	82000

Source: Own calculation based on data of the rural household survey

Such a comparison is also made for all successful applicants. This group is distinguished – as discussed above – by the fact whether they did not receive the full credit asked for (constrained households) and they obtained the full amount (unconstrained households). The data based on the rural household survey shows that among all successful applicants 33 households received the same amount of credit as applied for, and 54 did not.

It follows the same description of socio-economic characteristics between these two subgroups. As can be seen from Table (5-2), for the credit unconstrained households livestock husbandry is found by all of them, all their household heads are male, their level of education is 8.72 and they own assets of 17413 LYD in value. The differences in these characteristics to the constrained households are relatively small.

Table 5-2: Social-economics characteristics' of credit received constrained and unconstrained households.

1. Households credit constraints

Variables	Unit of measurement	Obs	Mean	Std. Dev.	Min	Max
Gender of household head	1 = male, 0=female	54	1	0	1	1
Level of education	Years	54	6.94	5.91	0	16
Livestock holding	1 =holding, 0= not	54	0.88	0.31	0	1
Households' assets	LYD	54	18766.67	20134.88	4700	82000

2. Households credit unconstraint

Variables	Unit of measurement	Obs	Mean	Std. Dev.	Min	Max
Head of households' gender	1 = male, 0=female	33	1	0	1	1
Level of education	Years	33	8.72	4.33	0	14
Livestock holding	1 =holding, 0= not	33	1	0	0	1
Households' assets	LYD	33	17.413	18400.54	4000	73000

Source: Own calculation based on data of the rural household survey

5.5 THE ROLE OF FORMAL BANKS IN CREDIT MARKET

Financial institutions dominate Libya's credit markets. During the last 35 years, the Libyan government imposed strict regulations for all of them; i.e. for all formal-banks. The LCB which is run by the government functioned as control organization. However, the Libyan government initially used and still continues to use agricultural banks for supporting agriculture. As instruments subsidized credit programs are offered. The other financial institutions, mainly commercial banks, are also under government regulation. In the beginning of 2000, the government started to privatize some of these commercial banks.

In this section, the role of these institutions in rural-credit markets is descriptively analyzed. For this purpose, the formal banks are divided into two types: agricultural banks and non-agricultural banks. According to the data of the rural household survey in the three selected regions non-agricultural banks provided around 69% and agricultural banks 24% of the loans and the remain 7% is provided by both banks .i.e. households borrowed from both type of banks. Figure (5-10) represents the distribution of credit among formal lenders in three selected regions.

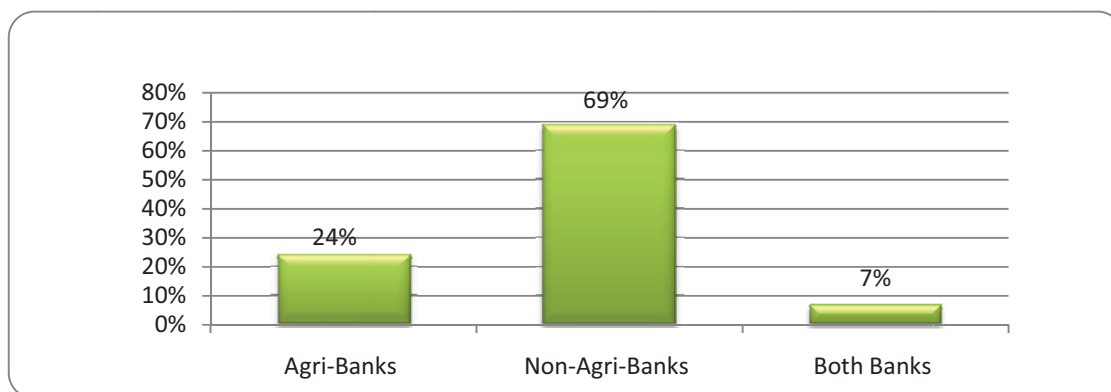


Figure 5-10: Shares of credit granted by the formal lenders in the three selected regions.

Source: Own calculation based on data of the rural household survey.

Despite the relatively large numbers of agricultural banks (44 in total) distributed across the whole country their shares in lending to agriculture is small. This fact raises the question about their efficiency and role in supporting the agricultural sector.

From the discussion of the rural credit markets in the three regions the following conclusions could be drawn. Half of the rural households in the sample were not able to get access to credit markets. This holds for all three regions alike and, therefore, might be rather similar in other rural areas of the country. This also implies a low participation in credit programs for agriculture provided by formal banks. In turn, this may have lead to the credit constraints a number of farmers faced. This also might impede on productivity and growth of the sector. In careful reading the explanations given this situation could have been influenced by some of the factors mentioned below:

- First, the human capital is important for making the market mechanism functioning appropriately which requires different approaches and skills for evaluating credit applications. The lack of such skills and experience might lead to reducing the efficiency of how banks operate in credit markets.
- Second, profitability of the agricultural sector is an important prerequisite for solving agricultural and rural credit problems. Low farm productivity reduces the capacity of repaying loans and leads to higher potential for loan default. Libya's agriculture might have too low a profitability. Shortage of water, for example, in terms of both quantity and quality might lead to low productivity and low investment in the agricultural sector, in general. Water availability is a real issue facing the Libyan agricultural sector that leads to the low investment in this sector and therefore decreases borrowing rates in rural areas.
- The third issue refers to lacking collateral among rural households. Financial institutions use of assets as collateral to protect their loans in case of default. In rural-areas, collateral plays an important role in farmer's abilities to secure external resources. In LDCs economies, collateral requirement of financial institutions for agricultural loans have often been higher because of transitional factors. To those belong lacking unambiguous property rights, incomplete asset markets such as for land as well as overall risk and uncertainty. Moreover, due to the poverty condition in rural areas there is a shortage of collateral which is one of the biggest challenges that lenders face.

5.6 GOVERNMENT CREDIT POLICIES

The Libyan government uses credit policy as an important instrument for supporting rural development. In a market economy, the government's role is to stimulate competition, provide information and create the legal and other important infrastructure for supporting efficiency and effectiveness of financial institutions. However, governments in developed countries still support the rural economy through directly fostering farmers' and rural activities or indirectly by intervening in agricultural markets in some years. Libya has implemented different policy programs which will be quantitatively analyzed by the following discussion.

Countries with sufficient resources have introduced some form of subsidized credit. These countries use different financial institutions such as agricultural banks, rural banks, co-operative banks and other organizations for providing support to poor households. On the other hand, countries with little resource endowments employ other program to also support the poor in rural area. They do this in co-operation with international organizations and donors. However, such subsidized credit programs as usually used by governments face some problems. Firstly, credit subsidies benefit mainly large farmers and have perverse effects on small farmer's access to credit. Furthermore, it is a well-known problem that due to the flexibility of credit, credit subsidies intended for agriculture may be diverted to other more profitable activities and, depending on the allocation procedure, they might induce opportunities for corruption. However, also in countries in which such programs are carefully managed, credit subsidies do not reach the small private farmers. The latter reflects a general problem of credit subsidies in less developed countries.

Libya is using agricultural banks to support farmers through credit programs which were available over many years in the past. Libya's agricultural banks offer credit at interest rates which are below the market rates. These credit programs are offered to small-scale producers for making investments in irrigation systems and other credit lines are for providing support to livestock holders during drought years.

Chapter 6

6. DETERMINANTS OF ACCESS TO CREDIT

6.1 MODEL ESTIMATION

In economy, there are many settings of outcomes considered as a discrete choice among a set of alternatives, rather than continuous outcome, which measure some activities. For example, modeling labor force participation¹⁵, the outcome of whether or not to make a major purchase or not, have access to credit or not and apply for credit market or not, etc, where in these examples are called discrete regression models, this means that the dependent variables assumes discrete values. When a probability of an event will occur; this can be written as a liner probability model:

$$y_i = x_i\beta_i + u_i \quad (6.1)$$

Where y_i is dependent variable of an event occur, i stand for individual households, x_i as usual can be a functions of underlying explanatory variable, which would simply change the interpretation of the β_i and u_i is the error term.

This chapter deals with discrete limited dependent variable, where binary choice model is used to determine factors that have impacts on the ability of access to credit in rural area. The response variable coded as 1 or 0, 1 if individual household has access to credit and 0 if not, a behavioral model of each of these outcomes, including several explanatory factors, that is called x . For a given set of x values, there are only two possible values for the disturbance, $(-x_i\beta)$ and $(1-x_i\beta)$ the disturbance follows a binomial distribution. Given the properties of the binomial distribution, the variance of the disturbance process, continued on x , is

$$Var(u|x) = x\beta(1 - x\beta) \quad (6.2)$$

¹⁵ For more information, see William. H Greene ; Econometric Analysis , Fifth Edition 2003 –P,664

Therefore, one cannot use the regression with a binary–response variable that cannot ensure that the quantity of the dependent variable will be positive for arbitrary x values, so another formulation of the model from an economic standpoint will be discussed in the next section.

6.1.1 Probit model

The normal distribution has been used in many analyses, given rise to the probit model:

$$p(Y = 1|x) = \int_{-\infty}^{x'\beta} \phi(t)dt = \Phi(x'\beta). \quad (6.3)$$

where, $\Phi(\cdot)$ is a notation for standard normal distribution function.

Estimation of binary choice models is usually based on the method of maximum likelihood. Each observation is treated as a single draw from a Bernoulli distribution (binomial with one draw). The model with success probability $F(x'\beta)$ and independent observations leads to the jointly probability, or likelihood function. Using maximum likelihood technique to estimate the parameters of the binary choice model, for each observation, the probability of observing y conditional on x may be written as:

$$P_T(y|x) \prod_{y_i=0} [1 - F(x_i'\beta)] \prod_{y_i=1} F(x_i'\beta), \quad (6.4)$$

The log likelihood for observation i may be written as follows:

$$\ln L = \sum_{i=1}^n \{y_i \ln F(x_i'\beta) + (1 - y_i) \ln [1 - F(x_i'\beta)]\} \quad (6.5)$$

And for the normal distribution, the log-likelihood is:

$$\ln L = \sum_{y_i=0} \ln [1 - \Phi(x_i'\beta)] + \sum_{y_i=1} \ln \Phi(x_i'\beta). \quad (6.6)$$

The Probit-Model is used to investigate factors that determine the ability of access to credit among individual households. A brief introduction of the model is also discussed in section 4.1.

Factors such as household characteristics, region, farm and other factors, denote vector x . In other words, the probability that individual household are able to access to credit or not that will depend on for instance on the head of households' gender, martial status, income, education, farm size, water availability, household assets, region, etc.¹⁶ Some of these factors are discussed in chapter 5. Using Stata-program the following results are represented in table (6-1).

Table 6-1: Factors determining the ability of access to credit.

Probit estimates					Number of Obs	330
Variables	Coef.	Std.Err	z	P> z 	95% Conf.	Interval
Head of Household (HH)	0.9019	0.2836	3.18	0.001	0.3460	1.4579
HH-gender	1.6349	0.6941	2.36	0.009	0.2744	2.9955
HH-marital status	0.8436	0.4599	1.83	0.037	0.0579	1.7452
HH-formal education	0.0614	0.0231	2.66	0.008	0.0161	0.1067
HH-monthly income	0.0015	0.0009	1.67	0.025	0.0002	0.0034
Farm Productivity	0.3013	0.1179	2.56	0.011	0.0702	0.5324
Water-source	0.4549	0.1125	4.04	0.000	0.2343	0.6756
Soil-type	0.3515	0.0930	3.78	0.000	0.1691	0.5340
Livestock-holding	0.6067	0.2627	2.31	0.001	0.0917	1.1216
Household assets	0.0784	0.0171	4.57	0.000	0.0447	0.1119
_cons	-6.7518	1.3251	-5.10	0.000	-9.349	-4.1546
					LR chi2(24)	162.23
					Prob > chi2	0.0000
					Pseudo R2	0.3547

Note: This result is own calculation based on model analysis

The results of models show the significant factors that have impacts on the probability of access to credit among households. The P values in column four show the factors have impacts on the probability of access to credit. However, the important comparable column with fourth one is the second column which represents the coefficients. This column shows the impacts of these variables on the probability of access to credit. But it's not possible to consider these coefficients as accurate values. The coefficient in table 6.1, give us just information that these variables have affect on the probability of access to credit among rural-households. To get exact affect of each variable on the probability of access to credit, marginal effects should calculated.

¹⁶ For more information on household characteristics' and unit of measurements, see appendix.

6.1.2 Computing the marginal effects

Apart of their signs, the coefficients in the binary choice model are not easy to interpret directly. One way to interpret the parameters and to ease comparison across different models is to consider the partial derivative of the probability and take further step of analysis of the marginal effects of individual household characteristics of having access to credit, i.e. $y = 1$ with respect to explanatory variables. The effect of a change in explanatory variables on the value of dependent variable, for a discrete explanatory variable, for example dummy, the effect can be determined from computing the implied probability for two different outcomes, fixing the values of all other explanatory variables.

$$\frac{\partial \Pr(y=1|x)}{\partial x_i} = \frac{\partial \Pr(y=1|x)}{\partial x\beta} \cdot \frac{\partial x\beta}{\partial x_i} = \Phi'(x\beta) \cdot \beta_i = \Phi(x\beta) \cdot \beta_i \quad (6.7)$$

In a binary-outcome model, a change in factor x_j does not induce a constant change in the $\Pr(y = 1|x)$, because $\Phi(\cdot)$ is a nonlinear function of x . One of the reasons of using $\Phi(\cdot)$ in the binary-outcome model is to keep the predicted probabilities in the range represented by the interval $[0, 1]$. This bounded property of $\Phi(\cdot)$ implies that the marginal effects must go to zero as the absolute value of x_i gets large. Choosing smooth distribution functions, like the normal and logistic, implies that the marginal effects vary continuously with each x_i . Wooldridge (2001).

After, using the log-likelihood of probit model, using Stata- program, it is possible to use the Stata-command to compute the marginal effects at the multivariate point of mean. Computing the marginal effects is to see, what is the change in the probability of access to credit if x_i variable has increased by one unite (in case of is x_i continues variable). What is the change in the probability of access to credit if x_i has changed form 0 to 1 (in case of x_i is dummy variable). What is the change in the probability of access to credit if x_i is equal to a certain value or a certain status (the probability of access if x_i is equal a certain value or status).

Table (6-2), is represents the marginal effect, one can evaluate the expressions at the sample means of each x variable in case of continues variables and for dummy variables, or at a certain value of x_i . The discussion of each variable will be given in the next section.

Table 6-2: Marginal effects of factors determinant access to credit.

Variables	dy/dx	Std. Err.	z	P> z	95%	C.I.	x
Head of Household @ husband	0.3587	0.112	3.20	0.001	0.139	0.578	1
HH-gender*	0.5443	0.136	4.00	0.000	0.277	0.811	0.963
HH-marital status @ married	0.3331	0.181	1.83	0.007	0.229	0.689	1
HH-formal education	0.0243	0.009	2.66	0.008	0.006	0.042	7.1
HH montly income	0.0006	0.003	1.67	0.015	0.001	0.001	228.209
Farm productivity@ increasing	0.1310	0.045	2.90	0.004	0.042	0.042	1
Water -source @ MMRP ¹⁷	0.1800	0.044	4.05	0.000	0.092	0.267	2
Soil-type@ Clay	0.1391	0.036	3.78	0.000	0.067	0.211	2.
Livestock holdings*	0.2381	0.099	2.4	0.006	0.043	0.432	0.781
Household-assets ¹⁸	0.0310	0.067	4.62	0.000	0.178	0.441	11.3903

(*) dy/dx is for discrete change of dummy variable from 0 to 1
 (@) ¹⁹ is representing the marginal effect at a specific value of x

Notes HH means; Head of household and HH monthly income means; income from off-farm activities.
 Source: This result is calculation based on model analysis

Table 6-2 illustrates the marginal effects of each factor, which represents on column two. The p values of column five, confidence interval in column six and average of each variable is represents in the right column. The discussion of the results will focus on the most significant factors that have affected the probability of access to credit. In addition, some variables' marginal effects are calculated at the certain status. For example, the impacts of water source on the probability of access are calculated for each water sources. But in table 6-2, shows only the highest one. The discussion of affect of each variable on the probability of access will be in the next section.

¹⁷MMRP is water provide by man made river project

¹⁸ Household assets measured in thousand Libyan Dinars

¹⁹ (@) is representing the marginal effect at a specific status of x_j

6.2 DISCUSSION OF MODEL RESULTS

6.2.1 Household's socio-economic characteristics and impact of the ability of access to credit

The results in table (6-2), shows, that the ability of access to credit in Libyan rural areas is determined by household's socio-economic characteristics, such as head of household, gender, marital status, level of education, monthly-income, and other factors such as farm-productivity, water availability, type of soil, livestock-holding and household assets.

The probability of access to credit increases to 36% if head of household is the husband, 25%, if head of the households is the wife, 8% and 1% if the head of the household are sons and daughters respectively, holding other variables constant, figure (6-1) illustrates probability of access to credit distributed by head of households.

The second factor that has an impact on the ability of access to credit among rural-households is gender of household head. The model reports that, if the head of household's gender changes from female to male that will lead to a higher probability of access to credit, which is about 54% compared to families where the head of the households are females, holding other variables constant. The result reflects the Arabian culture that does not allow females to borrow credit from formal lenders. Therefore, they have less chance of benefiting from credit programs. Rural family headed by females may be forced to rely on other financial resources such as relatives or savings or may rely on government income as a sole source of income. Households headed by females may have less chance of investing in economic activities if they want to start any business inside or outside agricultural sector to diversify their incomes.

The third factor that is related to head of households-social economic characteristics is marital status. Rural-households where the head of the household is married has 33% higher probability of access to credit, family where the head of the household is single have 26% of probability of access to credit and 20% and 6% if head of house is widower and divorced, respectively. Figure (6-2) illustrates the probability access to credit of each head of households' marital-status.

The level of education, which is measured here by (years in the schools), reports that if the head of household has one more year in school the increase in the probability of access to credit is by 02%, holding other variables constant. Households that have access to credit are higher in average years of schooling; they have 7.8-years average of schooling, other households that are not able to access to credit have 6.3-years average of schooling.

Head of households' income from off-farm activities has also impact on the ability of access to credit. Head of household's income is measured in LYD. If head of households' income increased by 1000 LYD for example, that will increase the probability of access to credit to 60% holding other things constant.

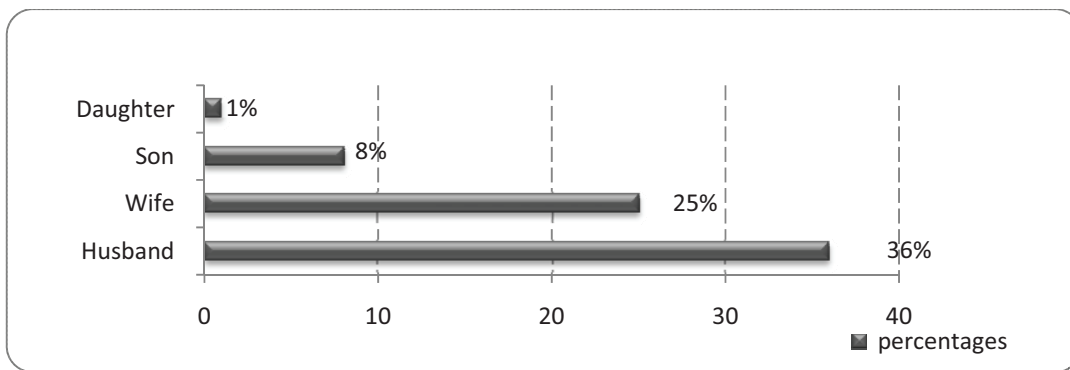


Figure 6-1: Probability of access to credit distributed by head of households.

Source: This result is own calculation based on model analysis.

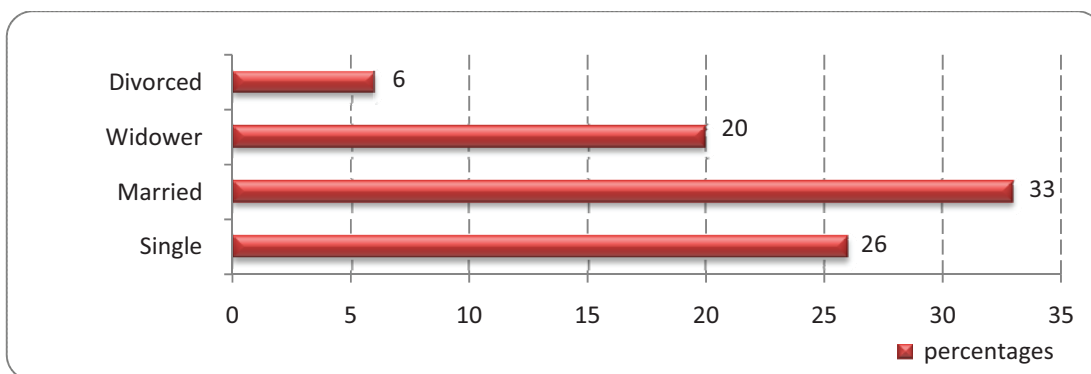


Figure 6-2: Probability of access to credit distributed by head of household's marital status.

Source: This result is own calculation based on model analysis.

6.2.2 Farm characteristics and the impact on the ability of access to credit

Farm characteristics have a significant impact on the ability of access to credit. In this section the discussion will focus on farm characteristics that include soil-types, availability of water and farm productivity overall. In model analysis the following are included: the types of soil that existed in the middle of the country and the results reporting farmers who are cultivating in (Clay-soil) have higher probability of access to credit, the probability of access to credit is increased by 14% if farmers are cultivating on clay -soil holding other factors constant. There are different types of soil in Libya, in the north part of country, for example (Brown Arid soil) that contains 60% of clay soil in Eastern part of Libya. (Reddish Brown Arid soil) that is in the west, middle and north of the country. (Saline-soil) is located in different parts, mainly the middle and far west of the country and (Clay-soil) is located in different parts of the country. In the southern parts of the country (Sandy-soil) is the main type of soil that exists in this part.

Availability of water is the main problem faced by farmers in Libya. Farmers who have permanent water sources have higher probability of access to credit compared to farmers who depend on only on rainfall. The model results show that if famers depend on water provided by MMRP in their irrigation increase the probability of access by 18%, holding other factors constant. Farmers who depend on ground water in their irrigation that increase the probability of access to credit to 15%, those farmers that haves shared water with other farmers that increase the probability of access to credit 11%, holding other factors constant. Farmers who depend on rainfall for their irrigation increase the probability of access 9% holding other things constant. The majority of farmers in Libya depend on ground water, due to the dry weather, and low average rainfall during the year. Water provided by MMRP and shared water provided by government both come from the ground. However, even the ground water that is used in the northern part of the country has higher salinity in some areas, due to extensive use and low rainfall that leads to rise in the salinity extent and reduces the water table, which makes agricultural sector faces serious problem that affects the food-security of the country. Figure (6-3) illustrates the marginal effects of each water source on the probability of access to credit.

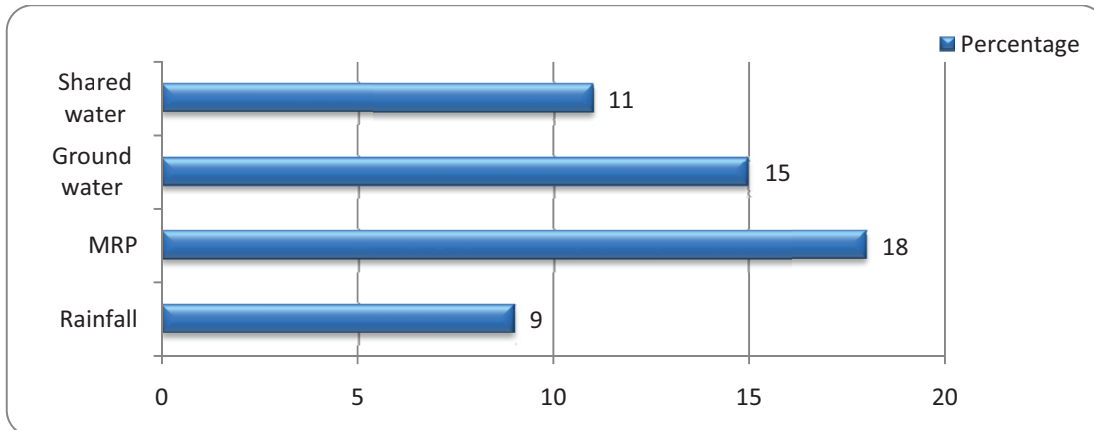


Figure 6-3: Probability of access to credit distributed by types of water sources.

Source: This result is own calculation based on model analysis.

The sources of ground- water have long been used in agricultural sector, especially near the coast in the northern part of the country, where around more than 85% of the population live. Despite the shortages of water quantity and quality, still some agricultural crop growing such as rainfall dependent grain varieties or even crops that require less water such as olives and almonds are cultivated in the north coast of the country. Agricultural development based on ground water has been vigorous especially in the private sector. According to Libyan Ministry of Agriculture (LMA), the total abstraction of 4200 million m^3 /year, which is about 8 times the annual renewable ground-water resources, therefore, Libya is depending heavily on fossil ground water.

Both soil type and water availability lead to increase or decrease in the productivity of farm overall. The probability of access to credit increases if farm productivity increases in status. The probability of access to credit is 13% higher if farm productivity increases in status holding other factors constant. This was very clear during the field research; farmers who have permanent water source produce some crops and livestock in their farms.

6.2.3 The impacts of livestock holding and household assets on access to credit

In this study, the results reported rural household that hold livestock have 23% higher probability of access to credit than households that do not hold livestock in their farms, holding other factors fixed. Livestock is an important income-producing item and maybe considered as collateral for households that apply for credit. Livestock shares the largest income in Libyan agricultural sector. Poultry and sheep form the dominating percentage of livestock, the majority of farmers hold livestock in their farms, 83% of households that are able to access to credit are holding livestock.

Household assets also have positive effect of increasing the probability of access to credit among households. Rural households that own more assets have higher probability of access to credit. The marginal effects reported in table (6-2) that if households' asset is increased by one unit²⁰ that increases the probability of access by 031% holding other things constant. If households' assets are increased by 10 units, then the probability of access will increase to 31%, holding other factors constant. Households that are able to access to credit are higher on average assets owned, the average assets owned are 14244 LYDs. Households that are not able to access to credit owned only 8466 LYDs on average. The model results show that access to credit increases with households' assets, i.e. visible household assets positively and significantly influenced the access to credit. This result may be explained in terms of personal guarantees serving as alternative collateral that is valued by formal banks.

However, households that did not own livestock or have fewer assets, will not able to access to credit. This means they do not benefit from credit programs and they might exclude from credit programs, because they are poor households. This point should be considered by formal lenders when they design new credit programs that target the poor.

²⁰ Household assets measured in thousand LYDs

6.3 SUMMARY

Results indicate that head of household's social-economic characteristics play an important role in determining the ability of access to credit in the Libyan rural areas. The results indicate that households headed by female have less probability of access to credit. Single household have also less chance to access to credit compared to households headed by a couple. The model reports that level of education; monthly income from off-farm activities has a positive effect on the probability of access to credit.

In addition, farm characteristics such as type of soil and availability of water on the farm have a significant effect on the probability of access to credit in the Libyan rural areas. Farm characteristics that include water-availability on farm, soil types and overall farm-productivity have significant impacts of access to credit. Households that have permanent water sources in their farms such as MMRP or ground water on their farms or water shared with other farmers have higher probability of access to credit compared to those households that only depend on rainfall. A good quality soil and permanent source of water lead to positive impact on overall farm productivity.

Holding livestock and owning assets have a positive impact on increasing the probability of access to credit. This effect is clearly illustrated in chapter 5, where a comparison has been drawn between households that have access to credit and households that have no access. Households that hold livestock have higher probability of access to credit, compared to those who do not hold livestock. The same result is found in comparing household assets'. Statistically, the mean, minimum and maximum values of household assets between two groups are different, households that have access to credit have higher mean, and their minimum and maximum are higher than those who have no access to credit. These results clearly indicate that credit programs offered by formal financial institutions exclude poor-households that have no assets or do not hold livestock. This conclusion should be taken into consideration when designing credit policies and financial services in the future.

Chapter 7

7. DETERMINANTS OF CREDIT APPLICATIONS

In the previous model, it is known from the sample that almost half of the households are not able to have access to credit and the discussion was about the main household's social-economic characteristics, farm and other characteristics affecting the probability of access to credit. In this chapter, the study goes a step further by investigating whether individual households that have access to credit, apply for credit or not, taking into consideration that applying for credit among household also depends on head of household's socio-economic characteristics, farm and other economic characteristics. The model determines access and applicability for credit using Bivariate Probit Model.

7.1 MODEL ESTIMATION

The model contains two dependent variables and includes explanatory factors that might have impacts on the probability of access to and applying for credit. Using such model is to determine whether there are different impacts of these factors on credit applications. For this study, factors such head of households' age, gender, education, income, marital status, family size and other socio-economic characteristics would be relevant in explaining why some households applied for credit and other not .i.e. this chapter determines the main factors that affect credit applications among households that are able to access to credit, with respect to factors mentioned above. Examining such variables of what have been known as Qualitative Response Models (QRM).²¹ The formal structure model is another example of a limited-dependent variable framework, in which a correlation of equations' disturbance plays an important role. In this analysis, it supposes that:

$y_1 = 1$, If a head of household have access to credit and 0 otherwise

$y_2 = 1$, If a head household is apply for credit and 0 otherwise

²¹ Model for Qualitative dependent variables can be found in most discipline in economics. A frequent use is found in labor economics and in the analysis of micro -level data sets.

The Bivariate Probit Model is similar to the selection model. Considering two stages process in which the second equation is observed conditional to the outcome of the first. In this study, individual-households that have access to credit are identified as $y_1 = 1$, for each household if he/she is able to access to credit. The second equation, $y_2 = 1$, is the variable used only for households that have applied for credit, which means that all households that have applied for credit, already all of them have access to credit. In this context, the reliance of the second equation on the first is an issue of partial observations. Poirier (1981) used this specification in a model with partial observations. In its simplest form, the model may be written as following:

$$\begin{aligned}
 y_1^* &= x_1\beta_1 + \varepsilon_1 , & y_1 &= 1 \text{ if } y_1^* > 0, 0 \text{ otherwise} \\
 y_2^* &= x_2\beta_2 + \varepsilon_2 , & y_2 &= 1 \text{ if } y_2^* > 0, 0 \text{ otherwise} \\
 \begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \end{pmatrix} &\sim N \left\{ \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix} \right\}
 \end{aligned} \tag{7.1}$$

where, x_1 is vector variables determining access to credit and x_2 are explanatory variables determining apply for credit. Using a Bivariate Probit Model with partial observations in which, instead of observing both y_1 and y_2 , it the product of $(y_1) * (y_2)$ is observed. Factors that determine access and applicability for credit are included. Most commonly, the parameters on binary choice models or limited dependent variable models in general are estimated by maximum likelihood. The log-likelihood for this model is as following:

$$\ln L = \sum_{y=1} \ln \Phi_2 [\hat{\beta}_1 X_1, \hat{\beta}_2 X_2, n] + \sum_{y=0} \ln (1 - \Phi_2) [\hat{\beta}_1 X_1, \hat{\beta}_2 X_2, n] \tag{7.2}$$

Where, Φ_2 is the bivariate cumulative normal distribution function, the model given above would be estimated using a complete sample on $[y_1, y_2 \text{ and } x_1, x_2]$. Using Stata-program the following results are represented in table (7-1).

Table 7-1: Factors determining credit applications.

Bivariate probit regression				Number Obs	330	
				Wald chi2(50)	144.02	
Applied for credit				Prob > chi2	0.0000	
Variables	Coef.	Std.Err	z	P> z 	95% Conf.	Interval
HH-marital status	1.282	0.492	2.61	0.009	0.318	2.247
Family size	0.101	0.037	2.67	0.008	0.026	0.174
HH-formal education	0.858	0.504	1.70	0.019	-0.130	1.846
HH-main occupation	0.289	0.081	3.54	0.000	0.128	0.449
HH-monthly income	0.009	0.002	3.69	0.000	0.004	0.014
Farm Productivity	0.523	0.140	3.73	0.000	0.248	0.798
Water-source	0.252	0.113	2.23	0.026	0.030	0.474
Soil-type	0.043	0.099	0.44	0.006	-0.151	0.239
Using machinery	0.698	.2983	2.34	0.019	0.114	1.283
Livestock-holding	2.275	0.416	5.47	0.000	1.459	3.091
Household assets	0.101	0.022	4.56	0.000	0.058	0.146
_con	-5.864	1.454	-4.03	0.000	-8.716	-3.013
/athrho	1.772	0.355	4.99	0.000	1.076	2.468
rho	0.943	0.038		0.791	0.985	
Likelihood-ratio test of rho=0:			chi2(1)=89.2421	Prob > chi2 = 0.0000		

Source: Own calculations' based on model analysis.

The results shown in Table (7-1), confirm that the same factors affecting access to credit, also have an impact on credit applications. The effects have different intensities as shown by the values of the coefficients. Head of households' socio-economic characteristics and farm characteristics are the major factors determining credit applications. However, the results of other new factors such as family size (number of persons in family that live in the same house) and use machinery in the farm, those two factors have impact on credit applications.

Again, the problem of using a binary choice model is that the estimated parameters are not easy to interpret. One way to make the analysis more accurate and easier for interpretation is to calculate the marginal effects of the explanatory factors, and to see the impacts of each factor on the probability of applicability for credit among households. Table 7-2 shows the marginal effects of each factor; i.e. the exact impact of a small change in each factor on the probability of applying for credit in the Libyan rural areas.

Table 7-2: Marginal effects of factors determinant credit applications.

Variables	dy/dx	Std.Err	z	P> z 	95% Conf.	Interval	X
HH-marital status @ married	0.374	0.142	2.62	0.009	0.094	0.654	1
Family size	0.029	0.010	2.86	0.004	0.009	0.049	7.945
HH-formal education	0.021	0.005	3.55	0.000	0.009	0.032	7.1
HH-main occupation @ public	0.124	0.021	3.95	0.000	0.042	0.126	4
HH-monthly income	0.002	0.001	4.45	0.000	0.001	0.004	228.209
Farm Productivity@ increasing	0.152	0.042	3.6	0.000	0.069	0.235	2
Water-source@ MRP	0.274	0.031	2.35	0.019	0.012	0.136	2
Using machinery*	0.220	0.103	2.12	0.034	0.016	0.423	0.39
Livestock-holding *	0.375	0.050	7.46	0.000	0.276	0.474	0.781
Household assets	0.029	0.011	3.64	0.000	0.014	0.046	11390.3

(HH-monthly income of head of household from off-farm activity).

Source: Own calculation based on model estimates.

The marginal effects of each actor on the probability of apply for credit is shown in column two. In this analysis, the marginal effect is calculated for different variables i.e. the marginal effect is computed when all xs are at their sample mean. The categorical explanatory variable such as marital status of head of household is calculated for different marital statutes of household heads. For example in table above shows the probability of apply for credit if head of household is married, because it has the highest value comparing with other households' martial statuses. The sign (@) in the table refers to probability of apply for credit if explanatory variable is equal a certain status. In addition, other explanatory variables, which are represents by sign (*) refer to dummy explanatory variables.etc. Column five represents the p value of each variable and the last column to the right is represents the average of each explanatory variable. The average of categorical variable, its show the only the cod number i.e. if head of households marital status is married recorded by 1. This column give an important information on continuous explanatory variables such as head of household income, assets and education (average years in schools), etc. All these factors are discussed in details next section.

7.2 DISCUSSION OF THE MODEL RESULTS

These factors are the same as discussed in chapter 6. For example, families where the head of households are married, the males have higher probability to apply for credit compared to families headed by females or those unmarried. Some years of schooling or permanent income from off farm activity are important characteristics of household heads for increasing the probability of credit applications in rural areas. Factors that are related to farm characteristics such as availability of water and use of machinery have also a significant impact on this probability. Households that hold livestock or own assets have higher probability to benefit from rural-credit programs offered by formal banks. In Table (7-2), there are some changes in factors that have had impact on credit applications, in comparison to factors discussed in chapter 6. The new factors such as family size, (number of persons in the family), is an important factor that determines credit applications and the second a new factor that determines credit application is the use of machinery. These two factors are not significant in the (Univariate) Probit Model introduced in chapter 6.

7.2.1 Household's socio-economic characteristics and credit applications

Head of households' marital status and family-size are the most individual households' social characteristics determinant to credit applications. Rural families where the head of the family is a male, his marital status is married and the family members are around 8 persons on an average, they are most likely to apply for credit. Rural- families where the head of the household is married, it increases the probability of applicability for credit by that 37% holding other things constant, the data in chapter 5 also shows that more than 91% of credit applicants are married, only 5% and 3% where the head of households' marital-status is unmarried and widowers respectively. Head of households' marital status might reflect the stability of incomes; family headed by couples might have more incomes and therefore have more saving than other families where the head of the household is unmarried.

Level of education also has a positive effect on credit applications. The probability of applicability for credit will increase about 02% in each additional year of a persons' education. The other social-factor that increases the probability of applicability for credit is the family size; this factor is found to be significant in determining the applicability for credit, but not significant

in determining access to credit among households in chapter 6. The average family size in the Libyan rural areas was found quite high, table (7-2) reported around 8 persons is average family size and the probability of applying for credit is increased with 3% on each additional person added to the family. In chapter 5, in comparison between two groups, the average family size is higher in those that have applied for credit than households that did. A large family probably means more members of family working and therefore the probability of members of them doing business that requires fund is higher than other families that have a few members. Moreover, big families mean more incomes compared to small families. This will increase the probability of investment and therefore require more funds.

Head of households' monthly income from off-farm activity have a significant impact on the probability of applicability for credit. Table (7-2), shows that if head of households' income²² is increased by 1 unit that will increase the probability of access by .0028%²³, but if the monthly income is increased by 100 LYD it will increase the probability of applying for credit by 28%, holding other factors constant. Statistically, head of households' monthly income is higher for households that applied for credit compared to households that have not applied for credit.

Head of households whose main occupation is in the public sector have a higher probability of applying for credit, which is 12% compared to other occupations, holding other things constant. Statistically, it also shows that 41% of households that have applied for credit are working in the public sector and 34% are retired, and only 9.7% of households that applied for credit have the main occupations in the agricultural-sector.

²² Income is representing monthly-income from off-farm activity

²³ 1 unit is 1 LYD which has very small impact due to small unit of measurement used in the model.

7.2.2 The impact of farm characteristics on credit applications

Credit is an important element in agricultural sector, particularly in production system. Availability of credit through solving the liquidity constraint allows producers to satisfy the cash needs induced by the production cycle that characterizes agriculture. In this study, farm productivity is one of the significant factors that has an impact on applying for credit in the Libyan rural-areas. Farm-productivity status is classified into three categories; first, farm productivity in increased status, second farm productivity in decreased status, and the third is farm productivity still the same status. Farm-productivity measured by comparing the net of four production seasons. The results shown in table (7-2) reporting that, if the farm productivity's status increases, the probability of applicability for credit will increase about 15% more than other farm productivity's status holding other factors fixed.

However, some other factors that might increase or decrease the farm productivity such as water availability quality and quantity, which is very important, factor in severe dry weather during the year. Water availability is a painful reality of life for much of the Libyan rural-economy. The shortage of water quality and quantity is the main challenge facing the rural-society. In addition, dry weather during the year making the problem more complicated all over the country. This situation of water supply has become more problematic with rapidly increasing population. The Libyan authorities began to design and install the hydraulic infrastructure needed to withdraw and transport the fossil-water to various demand sites along its Mediterranean coast, where most of the population lives and where the water is used.

In this study, the availability of water in the farm has a significant impact of access and applying for credit among rural-households. The result shows that if households have permanent water sources in their farms that will increase the probability of applicability for credit. The permanent water resource that is provided by MMRP for instance increases the probability of applicability for credit by 27%, holding other variables constant.

Despite strenuous efforts made by the government, many parts of Libya still face serious water deficit due to continuously increasing water demands beyond the limits of the availability of water resources. The water availability is the main issue facing the Libyan agricultural-sector. Shortages of water quantity and quality have negative impact on access and applying for credit, therefore that will have a direct impact in investment in such sector. Farmers face such problem are not going to invest or increase the production, which is to make agricultural sector unprofitable sector, such situation definitely will affect the food security, supply and demand of food and also the trade²⁴. These facts should be taken into account for policy in water and irrigation-management: the variability in water resources, water supply infrastructure as well as the alternative for water –policies and investment on water supply and demand in each region.

Most of the agricultural activities were included in RHS, which include both plant-production and animal –production, where the machinery is used. Owning machinery is an important factor determining credit applications, households that own or use machinery in their farms increase the probability of applicability for credit to 22%, holding other variables constant. Using the machinery in the farm has also a positive impact on farm-productivity in general. The results showed in table (7-2) above that also both using-machinery and the productivity’s status of farm have a positive effect on credit applications. Farmers who use machinery mean that they are able to cultivate their land, which is indicated the availability of water and a good soil or involved in other activities such livestock husbandry, chicken production, etc. This factor reflects the ability of investment in agriculture, particularly for activities that do not consume a large quantity of water or for farmers that have permanent water supply in their farms during the production seasons.

²⁴ According to Libyan Ministry of Economics, Libya imports more than 78% of food from other countries

7.2.3 The impacts of livestock holding and households' assets on credit applications

Holding livestock on the farm has significant effect of apply for credit among households. The probability of applying for credit is increased by 37% for those farmers that holding livestock in their farms compared to households that do not hold livestock. The results might reflect that livestock is considered by the farmers as an important cash income to repay back their credit and may be considered as a good asset for lenders as well.

Livestock in the Libyan agricultural sector plays an essential role in diversifying the portfolio of economic activities of farming households in mixed-crop livestock system. Livestock in Libyan rural area is often a primary investment opportunity for smallholders. Mixed cropping and livestock, act as major income source for farmers. Farmers get cash income through sales of their livestock and their products; in addition, livestock is also an important source of food for the majority of rural households. In the northern, part of Libya, where rainfall is stable for sustainability of mixed-cropping, livestock system, the majority of farmers hold livestock in their farms. Farmers also have the opportunity to buy livestock-feed, particularly during the dry season from the nearest markets, these markets almost exist in every large village in each region, and near the cities that are usually located in the agricultural zones near cities. In these markets, farmers can sell their animals and buy feed for the other animals at their farms.

However, holding livestock in the rural areas has also additional advantages, particularly it is easy to transport to different locations. For example some larger-sheep holders, usually they transport their sheep to the area where it has rainfall, and some large sheep holders sell in other market, looking for better price. Moreover, livestock is less sensitive to dry weather, because farmers are able to buy livestock-feed and sell their livestock at the same market. Another factor that makes the majority of farmers holding livestock is the government support, by providing them other services, for their livestock such as lower prices for vaccinations against some livestock diseases and by support of livestock feed price for farmers particularly in drought years. Based on RHS 92% of households that applied for credit are hold livestock in their farms and only 7.1% of credit applicants do not hold livestock.

In terms of production, livestock contribute 30% of the total agricultural production, providing meat, milk, dairy products and eggs. Sheep, goats, camels and chicken are the main livestock in Libyan rural areas. The supply of livestock products still do not meet the national demand partly because of several reasons, the most important is the availability of water in agriculture that leads to shortage of animal feed and the conditions of climate, which is usually dry during year for more than 90% of the total area of the country.

Households' asset is also a significant factor determining access to credit that is discussed in chapter 6. The results in table (7-2) reports that head of households who own assets have higher probability of applicability for credit compared to the heads of households that did not own or own fewer assets. If household assets increased by 1 unit²⁵ that leads to increase in the probability of applicability for credit by 029%, holding other variables constant. Supposing that household assets are increased by 10 units, this will lead to increase in the probability of applicability for credit by 29%, holding other variables constant. Formal lenders in credit market consider borrowers' assets as an important factor of credit repayments, because borrowers might use their assets for repaying back their loans in case their projects failed, and therefore borrowers might sell their assets and repay their loans. Moreover, the banks might use household assets as mortgage, which gives the bank the right to own the defaulters' house or land or any other assets if they fail to pay the money that is borrowed from the bank.

In the present analysis, household assets collected during RHS in year 2006/2007 that include the total assets of households. The variation between households in term of the total assets owned was quite large; therefore, household assets' variable is used in this study to determine the optimal sample size during the field research in each region.

However, household's assets in rural areas are quite difficult to be considered as factor for evaluating applications process, due to unclear property-rights, uncertainty of land market and other assets price, particularly in LDCs. In addition, the majority of households in LDCs are very poor, and they suffer from hunger and mal-nutrition, and they might sell their asset before going to formal lender to take credit.

²⁵ One unit is equal (1000)LYDs

7.3 SUMMARY

This chapter has investigated the factors that impact on credit applications in rural area. The results of the model indicate that rural-families where the head of the household is a married male, the average family size is around 8 persons, and their monthly income is around 228 LYD on average are more likely to apply for credit. Households with permanent water supply and which hold livestock and own assets have higher probability of applying for credit. In terms of agricultural activities, rural-families that hold livestock have the highest probability of applying for credit; this might reflect the effect of dry weather and low rainfall in Libya in general, where annual rainfall is around 200-350 mm per year in wintertime, particularly in the coastal area, and almost zero rainfall in the southern parts of the country.

Head of household's main occupations also have effect on the probability of applying for credit. The majority of households in the study sample works in the public sector or are retired from it, which means they depend on off-farm activity and have stable monthly income and only 10% of households are dependent on agricultural sector as a main occupation, which is quite low, particularly in rural areas.

Water availability is a real issue facing Libyan agriculture and has a significant impact on both access and applying for credit, availability of water in the farm increases the probability of access and applying for credit among rural households. Water availability has a significant impact on production and food security overall.

The probability of applying for credit is increasing among households that own assets and have monthly income from off-farm activity. These results might lead to the conclusion that poor people are excluded from credit programs that are provided by formal banks. Poor households in rural-areas that own assets not at all or only few of them, those that have no income and do not hold livestock are not able to improve their incomes, because they are excluded from such credit programs.

Chapter 8

8 AMOUNT OF CREDIT RECEIVED DETERMINATION

In the previous chapters, the variables explaining the probability of access to and application for credit were discussed focusing on the main factors that have impact on access and credit applications among households in three selected regions. In this chapter, the objective is to complete the analysis for those households that have received credit by explaining the amount of credit received and to investigate the effect of household's socio-economic characteristics, regional, farm and other factors such as interest rates. In this chapter, data that include only households that have received credit is employed; this data covers households and formal lenders' characteristics that might determine amount of credit received. These factors are used as explanatory variables. A multiple regression model is used to determine amount of credit received among applicants.

8.1 MODEL ESTIMATION

A linear regression model with more than one independent variable is called multiple regression model. This means that there is more than one factor that affects or causes changes in the dependent variable. A multiple regression model allows testing how well a dependent variable can be explained on the basis of multiple independent variables. This chapter investigates factors that cause changes on amount of credit received among households. In this case, households received a certain amount of credit, which will depend on his/her socio-economic characteristics, farm, and loan characteristics that include interest rate, different types of loans such as seasonal or short-term loans, medium and long-term loans and repayment modes, etc. The dependent variable in the model introduced here is the amount of credit received. The linear regression model of each observation in the sample has the following form.

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x_{i,1} + \hat{\beta}_2 x_{i,2} + \hat{\beta}_3 x_{i,3} + u_i \quad (8.1)$$

where, $x_{i,1}$, $x_{i,2}$, and $x_{i,3}$ are set of variables included (household, farm, and financial institutions characteristics), $\hat{\beta}_1$, $\hat{\beta}_2$ and $\hat{\beta}_3$ are parameters to be estimated and u_i is a stochastic disturbance, representing the net effect of all other unobservable factors that might influence \hat{y} , where \hat{y} is the amount of credit received.

After estimating equation (8.1) using the Stata-program, the amount of credit received is determined only by formal lenders' factors because all other variables were not statistically significant. Therefore, the new equation includes only the factors that have an effect on the amount of credit received. The new regression equation includes only those two factors.

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x_{i,1} + \hat{\beta}_2 x_{i,2} + u_i \quad (8.2)$$

Where, \hat{y} is amount of credit received, $\hat{\beta}_0$ is the intercept, $\hat{\beta}_1$ measures the change in y with respect to x_1 , holding other factors fixed, and $\hat{\beta}_2$ measures the change in y with respect x_2 , holding other factors fixed, x_1 , x_2 both are factors related to formal lenders characteristics, which representing interest rate and repayment period respectively. The variance of its distribution σ_u^2 is an unknown population parameter to be estimated along with β parameters. It is assumed that $N > k$: to conduct statistical inference, there must be more observations in the sample than parameters to be estimated. The estimation results of this model are presented in Table (8-1).

8.2 MODEL RESULTS

First, the model in general is statistically significant, which is reported by F-test. Moreover, R-square of the model is quite high (0.71). The R-square; is the proportion of variance in the dependent variable, which can be predicted from the independent variables. The model shows that approximately 71% of the variance of amount of credit received, is accounted by the two independent variables in the model or more precisely, is that the interest rate and the repayment period of credit are representing 71% of the variance of amount of credit received. Adjusted R-square; as predictors are added to the model, each predictor will explain some of the variance in the dependent variable. The adjusted R-square attempts to yield a more honest value to estimate the R-squared for the population. The P-value associated with F-value is very small (0.000), these values are used to answer the equation (Do the independent variables reliably predict the dependent variables?), the P-value is compared to alpha level (typically 0.5). The P-value of is smaller than (0.5) in each independent variables, therefore this question can be answered above

as (Yes), the independent variables reliability predict the dependent variable. The output of the model represents in table 8-1.

Table 8-1: Factors determining the amount of credit received.

Number of obs	=	87				R-squared	=	0.7198
F(2, 84)	=	107.92				Adj R-squared	=	0.7132
Prob > F	=	0.0000						
Total	1.8162	86	311168739			Root MSE	=	7782.9
Amount of credit received	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]			
Interest rate	-446.9534	200.811	-2.23	0.002	-844.8365 -49.07022			
Repayment period	587.5384	42.40397	13.68	0.000	503.2134 671.8633			
_cons	7950.213	1806.056	4.40	0.000	4358.672 11541.57			

8.2.1 The impacts of interest rate on amount of credit received

In equation (8.2), the value of β measures the effect of one unit increase the corresponding variable on y . The coefficient showing the impact of the interest rate on amount of credit received. The β_1 has a negative sign (see Table (8-1)). The interpretation is that if interest rate is increasing by 1%, this will lead to a decrease in the amount of credit received by (446) LYD on average holding other variables constant. The rate of interest has important impact on credit demand and amount of credit that households or firms applied for, therefore an increase in interest rate will have impact on investment.

According to economists, demand for investment capital by firms or households is negatively related to the interest rates²⁶. At low rate of interest, more investment projects become economically viable and firms require more funds to finance their projects. On the other hand, if the rate of interest rises to high levels, fewer investment projects will be pursued and fewer funds will be required from financial markets. A higher rate of interest will eliminate some business investment projects from being considered, because the expected return is lower than the cost of borrowed fund. But in case of lower rate of interest, many projects look profitable, with their expected return exceeding the cost of funds. Therefore, the quantity of loan-able funds demand is increasing as the rate of interest falls of course with respect to other factors. Both cases will have

²⁶ The relationship between investment and rate of interest is discussed in details in chapter 2.

a direct impact on investment and therefore in growth. In case of rises interest rate farmers in agricultural sector will delay their investments by delay in adapting new technology or buying other production inputs, which causes a negative impact on production, food, incomes and the overall wealth.

As one effect of imperfect information (that is discussed in the theory chapter), higher interest rate might lead to so called adverse selection. The adverse selection occurs when lenders increases interest rate, the good borrower (self-select out) and they will not borrow, due to increase of risks and therefore, only bad borrower will be in the market as a higher interest rate also leads to low return to the lenders. This means that lenders will increase interest rate until a point where expected returns will decrease. Households and firms will not be able to cover loan plus interest rate and only riskier-borrowers will be in the market, and they might invest in the projects that have higher return in a short time, which are usually risky-projects.

As can be seen from Figure (8-1), due to the government supports interest rates charged by agricultural banks are lower compared to other banks, mainly commercial banks, which are called in this study as non-agricultural banks. Agricultural banks offer different credit programs that consist of three types of loans: Short-term loans, the purpose of such loans is mainly for yearly production inputs and size of these loans is small. Medium-term loans take longer period of repayment and are larger than the previous one. Long-term loans, these types of loans are mainly designed for new farmers and for households that plan to build a house. However, recent research indicates that households are not particularly responsive to the rate of interest when they seek credit but focus instead principally on non-price terms of a loan, such as the down payment and repayment period etc. The impact of repayment period on amount of credit-received will be discussed next section.

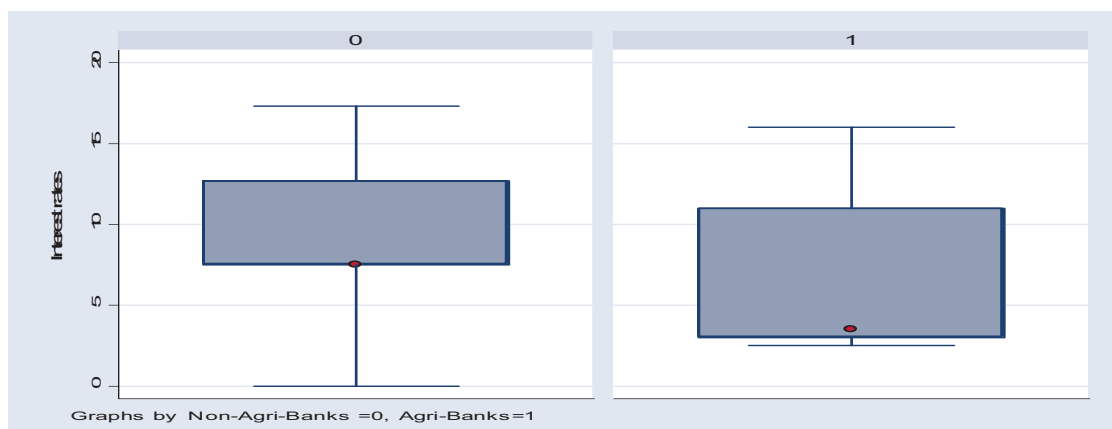


Figure 8-1: Interest rates charged by agricultural and non-agricultural banks.

Source: Own calculation based on model results.

In this section, the total number of Households that received credit is 87. Households received credit from both types' banks. The lines below and above these rectangular is represents the minimum and maximum level of interest rate charged by both banks. The blue area shows the minimum and maximum level of interest rates charged among this sample of study and the red point represents the Median. Agricultural banks charge lower interest rate that showed by the blue area comparing with non-agricultural banks.

8.2.2 Repayment period and the impacts on amount of credit

The second factor, which is determining the amount of credit received, is the repayment period. The value of parameter β_2 in equation (8.2) is referring to the impact of repayment period on the amount of credit received. The interpretation of coefficient of β_2 shows that if the period of repayment is increased by one unit which is measured in years the amount of credit received will rise by (587) LYD holding other things constant.

From, the economic point of view, this is correct result, because borrowers are affected by the repayment period. Households and firms considering repayment period as important factor that help to success the projects. In agriculture for an example, those Households who established new farm might need some years to start the production and therefore, they might prefer long repayment period, they might apply for medium or long term loans, rather than short term loans. In addition, rural household that take loan to build a house, every additional year longer of

repayment is important, because they need larger amount of credit and longer repayment period to complete their houses comparing with other activities.

However, the government policy that might encourages economic growth by supporting agricultural activities through longer repayment period or/ and subsidized credit programs. This policy is quite clear in agricultural banks lending programs. Agricultural banks which supported by government through 44 branches, offers three type of credits based years of repayment. Short-term credits, these types of credit are usually small in values and the repayment period is not more than 3 years. Second are medium-term credits, which take from 3-10 years of repayment and the values of these credits are larger than small-term credits and repayment period takes longer time, this is less than 10 years. The third type of credit is long-term credit, these types of credits are large in value and the repayment periods are longer than other types and takes 10 to 50 years to be repaid. The long-term credits are usually for rural-housing, and other economic activities that take long time for investment return.

Households and consumers in general need credit to purchase a home, buy production inputs, run a new business, etc. The volume of credit extended by the money and capital markets is huge and growing. The long-term loans are of larger size and encourage firms and households to invest in items which require large amounts of financial means and have a positive impact on investment, poverty and growth. The relationships between these aspects are discussed in details in chapter 2.

8.3 SUMMARY

In this chapter, multiple regression model is used, focusing on factors that determine amount of credit received among households. In this model, variables that also were used in pervious chapters, such as household's socio-economic characteristics, farm, and banks factors had been originally included in the analysis. But the parameters of households' socio-economic characteristics turned out to be statistically not significant. Therefore the model reported in Table 8-1 does not contain anymore these variables. What remained as determinants are the interest rate and repayment period. Their parameters are statistically significant and they explain 71% of the variation in the amount of credit lent by banks. The level of interest rate has a negative sign in the model. The opposite sign, i.e. appositive one, as between interest rate charged and amount of credit received is found to hold between the period of repayment and the dependent variable. Hence, increasing the length of lending positively affects on the amount of credit received, stimulates making large investments and with that the growth of the economy in general.

Chapter 9

9. DETERMINANTS OF CREDIT CONSTRAINTS

High degree of risk in rural areas and the lack of information on infrastructure imply that rural credit markets in developing countries are likely to suffer from serious imperfection which leads for the majority of farmers face binding credit constraints. In spite of general perception that rural financial markets perform poorly, relatively little empirical evidence exists about factors that help implementing policies which ease the impact of credit constraints on productivity in agriculture. The primary objective of this chapter is to investigate whether households face a credit constraint or not. This analysis uses data obtained by a direct elicitation approach based on RHS discussed above in chapter 4. According to the data households are classified as constrained or unconstrained with respect to the type of institutions and to socio-economic characteristics of rural households. The analyses identify whether credit constraints are due to interest rates and/or socio-economic variables of households. The approach that is used here is a combination of observed outcomes and qualitative questions based on primary-data collected during the years (2006) and (2007).

9.1 MODEL ESTIMATION

First, households are divided into two categories; successful applicants that have received credit and unsuccessful applicants whose applications are rejected and therefore they did not receive credit. It is supposed that those households that applied for credit and their applications were rejected are access constrained. Others their applications were accepted are not constrained in term of access. The number of observations used in this assessment is 103.

Second, borrowers are regarded as being credit constrained if the amount of credit received is less than the amount of credit applied for. Other borrowers that received the same amount of credit which they applied for are considered as credit unconstrained households. The total sample used in this analysis is composed of those 87 households that received credit.

In this chapter, a Logit model is used for both analyses. In the first one, those factors are to be identified which determine whether a household is credit constrained or not. The study discusses the possibility that credit constraints may originate from two sources. The first one cause a credit

constraint for those households that have applied for credit but their application was declined due to lack of collaterals or other factors related to contract terms. The second source of credit constraints applies to borrowers that have received a certain amount of credit which is less than the amount they applied for. Those borrowers are also considered as being credit constrained.

In qualitative response models, the response variable, y , is a random variable taking on a finite number of outcomes. In practice, the number of outcomes is usually small. The leading case occurs where y is a binary response, taken on the values zero or one, which indicate whether a certain event has occurred. The probability of face credit constrained is as the following:

$Prob Y(1|x) = 1$, if household's head is facing credit constraints

$Prob Y(1|x) = 0$, if household's head is not facing credit constraints

The logistic distribution can be represented as follows:

$$Prob Y(1|x) \frac{e^{x'\beta}}{1+e^{x'\beta}} = \Lambda(x'\beta), \quad (9-1)$$

where, $\Lambda(\cdot)$ indicates the logistic cumulative distribution function, Greene (2006).

For computing the marginal effects, the logistic distribution takes the following form:

$$\frac{d\Lambda(x'\beta)}{d(x'\beta)} = \frac{e^{x'\beta}}{(1+e^{x'\beta})^2} = \Lambda(x'\beta)[1 - \Lambda(x'\beta)] \quad (9-2)$$

Thus, in the logit model

$$\frac{\partial E[y|x]}{\partial x} = \Lambda(x'\beta)[1 - \Lambda(x'\beta)] \quad (9-3)$$

And the likelihood equation becomes

$$\frac{\partial \ln L}{\partial \beta} \sum_{i=1}^n (y_i - \Lambda_i) x_i = 0 \quad (9-4)$$

9.2 MODEL RESULTS

As is mentioned in chapters 6 and 7, using binary choice models has also its limitations. One of them is that its results are not easy to be interpreted. This can be avoided by calculating the marginal effects. For computing them one can take the sample means of the data or evaluate the marginal effects at every observation and use the sample average of these individual outcomes. This study used the marginal effect at the mean i.e. computing the marginal effects when x s at their sample mean. In this chapter the following results of marginal effects are represented after using the logit model. Tables (9-1) and (9-2) represent the factors which impact on the probability of being access constrained and credit constrained, respectively. The second columns in both tables represent the marginal effects each factor has on these probabilities. The third columns show the p- values and the fourth columns represent the average of each explanatory variable included in the models. The results depicted in these tables will be discussed in the next section.

Table 9-1: Factors determining the probability of households which applied for credit of being access constrained.

Variable x	dy/dx	P>z	Mean of X
Holding livestock*	-.7825278	0.004	.92233
Assets in (000) LYD	-.008587	0.002	17.0063
Head of household's income in LYD	-.0010207	0.003	212.621

Source: Own calculation based on Logit model

Households that applied for credit and their applications refused are credit constrained and other households that applied for credit and their applications are accepted are credit unconstrained.

Table 9-2: Factors determining the probability of households which received credit of being credit constrained

Variable x	dy/dx	P>z	Mean of X
Assets in (000) LYD	.012652	0.002	18.2534
Head of household's income in LYD	-.0047458	0.000	219.31

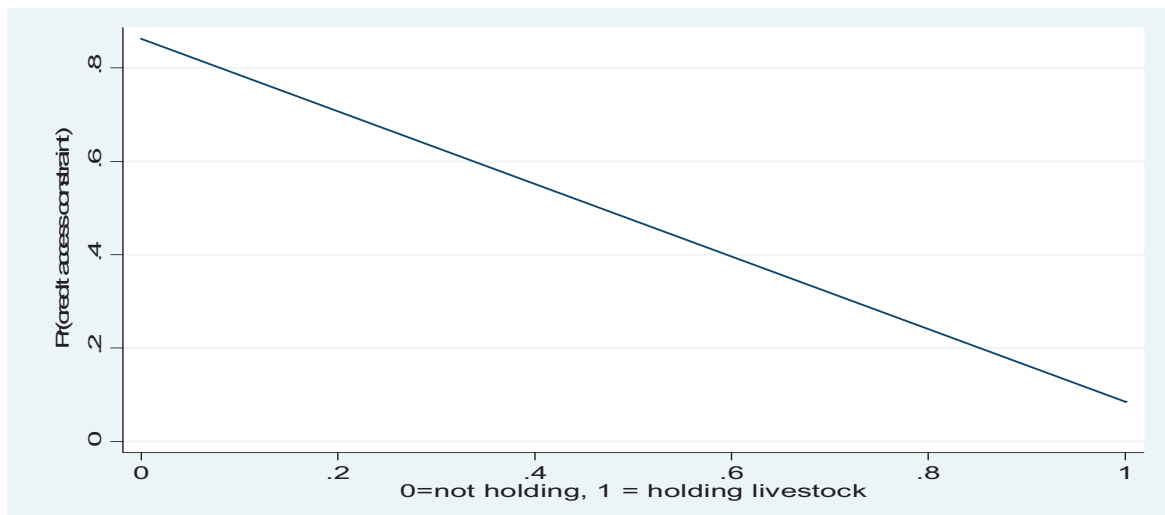
Source: Calculation based on logit model

Households that received credit and their amount of credit received is less than amount applied for are considered as credit constrained, and other households that received credit and their amount of credit received is equal to amount of credit applied for are considered as credit unconstrained

9.2.1 Probability of households which applied for credit facing credit constraints

The marginal effects of the Logit model are reported in Table 9-1. The model employed explains the probability of households, which applied for credit, of being access constrained. The results indicate that the probability of such households facing an access constraint decreases by 78% if household is holding livestock. In another words, households of which livestock husbandry is a production activity have a lower probability, of facing access constraint. Holding-livestock is also an important factor for having access to and applying for credit as discussed in the earlier chapters.

The marginal effects are not constant. They vary as the explanatory variable takes on different values. These changes in the marginal effects can be shown graphically for each variable. This is done for the current analysis. Figure (9-1) depicts these varying marginal impacts graphically for the determinant livestock husbandry. The vertical axis of this figure represents the probability of facing access constraints and the horizontal one those households which hold livestock or do not. The probability of facing access constrained decreases among households that hold livestock and increases among those who do not. The figure shows also that those households which do not hold livestock face a higher probability of being access constrained than those that holding livestock. The probability is represented by the sloped line.



9-1: The impact of livestock holding on the probability of being access constrained.

Source: Own calculation based on model results.

The second determining factor household assets were found to have an impact. This variable is also important in all models used to explain access to and application for credit as discussed in the previous chapters. In Table (9-1) the marginal effects of household assets have a negative sign. The impact of this factor on the probability of access constraints is shown graphically in Figure 9-2. The vertical axis represents the probability of being access constrained and the horizontal axis represents households assets in thousands LYD. The probability of facing an access constraint decreases with a rise in the amount of assets households have. Households that owned more than 40 thousands LYD are most probably not access constrained.

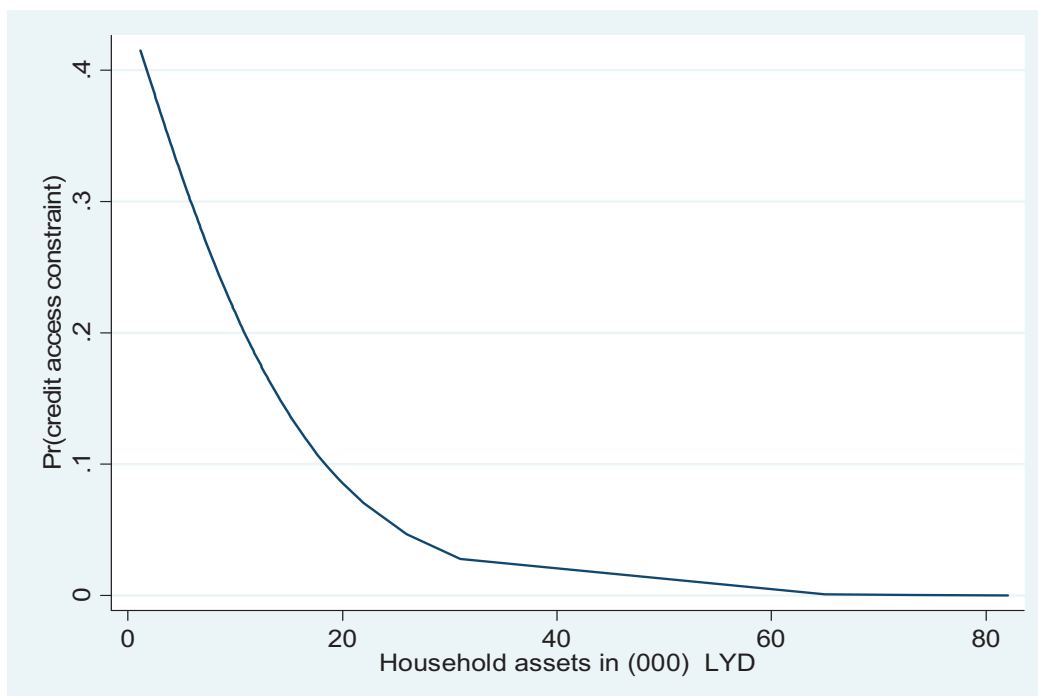


Figure 9-2 : The impact of household assets on the probability of being access constrained.

Source: Own calculation based on model results.

A third factor that affects the probability of facing access constraints is the household head’s monthly income from off-farm activities. The marginal effects depicted in Table (9-1) show a negative sign of this factor on the probability of being access constrained. The vertical axis of Figure (9-3) shows the probability of facing access constraints and the horizontal axis represents the household head’s off-farm income. The figure shows that who earns off-farm a monthly income above 300 LYD has to cope with a very low probability (about 0.05) of access constraints. This probability increases sharply as the off-farm income declines. For example, if it is only one third, i.e. 100 LYD the probability reaches a value of 0.3 which means a six-fold increase. This result reflects formal lender’s credit policies. They usually ask for a monthly income to secure the regular repayment of loans.

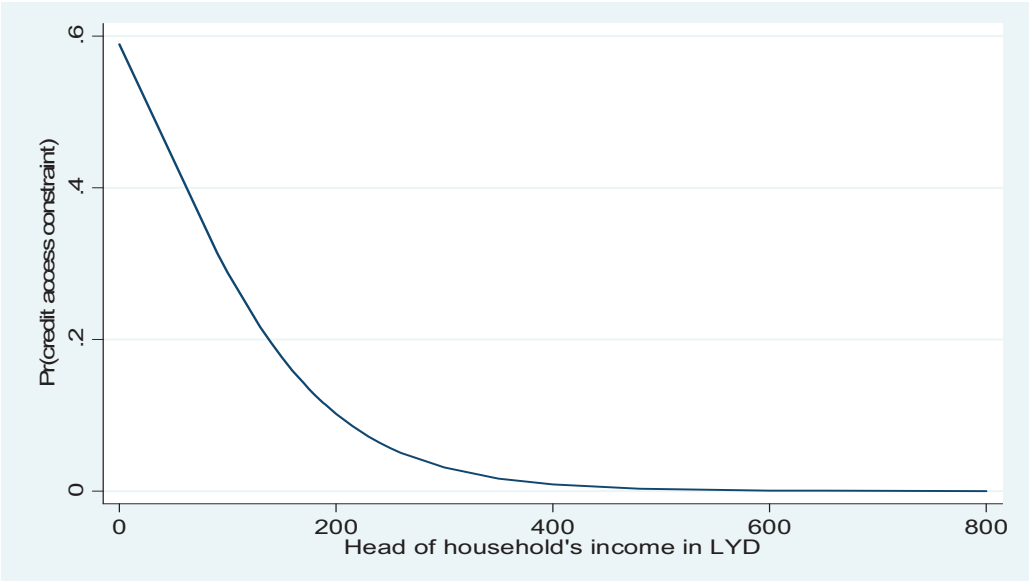


Figure 9-3: The impact household’s income on the probability of being access constrained.
 Source: Own calculation based on model results.

9.2.2 Probability of households which received credit but face a credit constraints

The second model of this chapter is to determine the probability of households receiving credit but face a credit constraint - called here “households amount constraint”. The marginal effects among others of the logit model are depicted in Table (9-2).

Household assets in this model have a positive sign. This means that the probability of facing a credit amount constraint increases with the amount of assets a household holds. The vertical axis of Figure (9-4) represents the probability of facing a credit amount constraint and the horizontal axis represents the amount of household assets. The figure shows that the marginal effects of the amount of household assets on the probability increases at a decreasing rate. This seems to indicate that borrowers who own more assets apply for a larger amount of credit and then face a higher probability of having this volume denied. However, they receive some credit which is less than what was applied for making them credit amount constrained.



9-4: The marginal effects of household assets on the probability of becoming credit amount constrained

Source: Own calculation based on model results.

The second factor that has impacts on the probability of facing credit amount-constraint is monthly income of the household head from off-farm activities. Table (9-2) shows a negative sign for this variable. Figure (9-5) depicts these marginal effects. The vertical axis represents the probability of being credit amount constrained and the horizontal axis represents the monthly income. The probability of facing a credit amount constraint increases as this monthly income decreases. These changes are relatively small at low income levels, become large at the range of income of about 200 to 400 LYD and decline thereafter. Heads of households that earn more than 400 LYD per month face a low probability of becoming credit amount constrained because they can use part of their income for investment and the lenders consider a higher monthly income as an indicator for a higher repayment schedule. At income of about 600 LYD and above the change in the marginal effects is nearly zero.

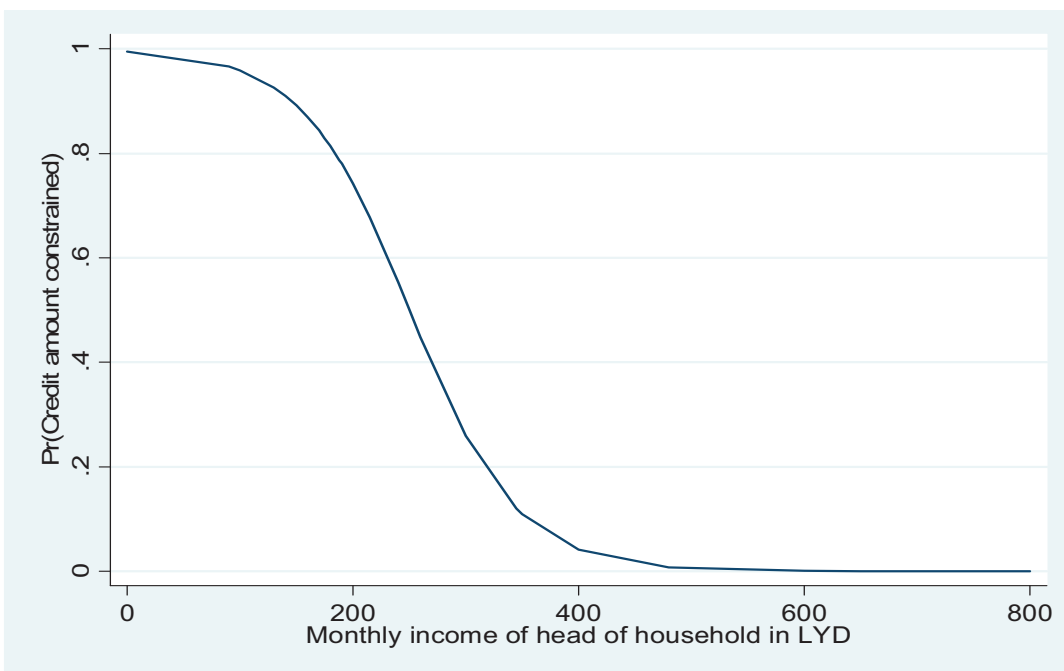


Figure 9-5: The marginal effects of household income from off-farm activities on the probability of becoming credit amount constrained.

Source: Own calculation based on model results.

9.3 SUMMARY

In this section, it can be concluded that households' economic characteristics such as off-farm income, livestock holding and the volume of own assets are the major factors that have impacts on the probability of credit constraints among applicants.

Households that hold livestock on their farm have a lower probability of credit access constraints, compared to those who do not hold livestock. This result reflects that livestock husbandry is an important economic activity in Libyan rural areas and used as important means for coping with liquidity problems.

Household's assets have different impacts on credit constraints. First, the negative sign on the probability of being access constrained indicates that the more assets owned the less is the probability of facing access constraints. However, in the second group "credit amount constrained households", household assets have a positive sign. The more household assets owned, the larger the probability facing credit amount constraints. The borrowers who own more assets might ask for a larger amount of credit which is more likely of not being offered in full size by lenders.

The third factor that has impacts on credit constraints is monthly income of household heads from off-farm activities. The lower this monthly income is the higher the probability of facing credit access and amount constraints. This indicates that the monthly income may be considered by lenders positively with regard to a regular loan repayment.

Chapter 10

10 CONCLUSION AND POLICY RECOMMENDATION

10.1 INTRODUCTION

This study investigates how large and important rural credit markets in Libya are, particularly for households that live in rural-areas. It identifies factors that impact on access to and application for credit, on the amount of credit received among successful applicants and whether households face credit constraints. The study provides insights about the relative importance of various socio-economic factors of rural households and of formal banks' credit programs within or beyond the control of policies that determine whether or not some households will benefit from such programs. The analysis relies on econometric models which provide a useful framework for investigating the relationship between lenders and borrowers, and describe the role of agricultural and non-agricultural banks in the credit market.

10.2 ACCESS TO CREDIT

Rural households in Libya lack access to credit. Around half of the households surveyed have no access to credit. The results indicate that the socio-economic characteristics of the household heads have a significant impact on determining access to credit. Rural families headed by males who had some years of education, earn income from off-farm activity and with good farm productivity. The latter is influenced by factors such as quality of soil, permanent water availability and livestock husbandry. Families with these characteristics have a higher probability of access to credit. On the other hand, rural households that are headed by a female with no education and whose farm productivity is low due the poor soil quality and/or lack of water sources as well as own few assets and do not owned livestock are not able to access to credit. In other words, poor people are likely to be excluded from credit programs.

10.3 CREDIT APPLICATIONS

Socio-economic characteristics of household heads have a significant effect on credit applications in the Libyan rural areas. Households headed by married males, households that have permanent incomes from off-farm activities, farmers that have permanent water source on their farms and use machinery, farmers who hold livestock on their farms and own assets, all have higher a probability of applying for credit. Rural-families that are headed by females, who have no water on their farms, do not hold livestock and own few assets have a lower probability of applying for credit. Therefore, they do not benefit from credit programs that are offered by formal banks. The formal banks in Libya consider for lending only those households that have enough collaterals and assets. Other poor households have a higher probability to be not able to participate in credit programs offered by formal banks.

10.4 AMOUNT OF CREDIT RECEIVED AMONG HOUSEHOLDS

In terms of successful and unsuccessful credit applications, 84% of households that applied for credit have received credit and only 16% of applicants were refused credit facilities according to this study. For formal lenders the main factors explaining the amount of credit to be given are the interest rates charged and repayment-periods of credits. These two factors describe 71% of the variation in credit received. The level of interest rate has a significant effect on the amount of credit given by lenders. Borrowers apply for lower amounts of credit if the interest rate is high and vice versa.

Borrowers in rural areas are tending to borrow more amount of credit if the repayment period takes longer time and less amount of credit if the repayment period takes short time. Interest rate charged by agricultural banks is lower than the ones charged by non-agricultural banks. Despite 44 agricultural bank branches distributed across the whole country, the share of these banks in rural credit markets is quite low, which reaches about 24%. The remaining shares are provided by non-agricultural banks which imply that the commercial banks play important roles in lending in rural areas.

10.5 HOUSEHOLDS CREDIT CONSTRAINTS

Economic characteristics such as livestock holding, monthly income and owning assets have a significant effect on the probability to face access constraints among applicants. Household heads in rural areas that depend on livestock husbandry, have higher monthly income or own assets face a lower probability of credit constraint. On the other hand poor households that do not depend on livestock husbandry, have lower monthly income or own fewer assets face a higher probability of being credit constrained of the two types mentioned above. However, household that owned large assets might face credit amount constrained, because they might asking for larger amount of loans that not offered by formal lenders.

10.6 POLICY RECOMMENDATION

Development of the financial sector is a key ingredient in the promotion of agricultural production and transformation, and it represents an essential element of any poverty reduction effort, income diversification and growth. Despite, the challenges that are faced by the Libyan agricultural sector, such as water shortage, soil quality and other overall productivity, around is 15-20% of total population is engaged in this sector. This fact should be taken into consideration by decision makers and lenders to keep rural households in the agricultural sector by offering them more service through appropriate credit programs. Improving access and participation in credit markets by increasing the number of applications are highly recommended through designing an effective administration strategy that raises profitability, lowers risks and avoids those issues that might lead to prevent the farmers' access to credit. Policies aiming at improving agriculture to enable the sector to compete for credit are not sufficient. It is important to encourage those farmers and related agricultural activities, which are likely to be profitable in the long-term to invest in agricultural sector through providing them credit on fair conditions. Agricultural banks' lending programs should be extended to support farmers and rural families particularly for families that are headed by females and provide credit to poor households that own fewer assets or those that do not have enough collateral.

BIBLIOGRAPHY

- Adams, D.W and Jerry Ladman, (1979). Lending to the Rural Poor Through Informal Groups: Promising Financial Innovation? *Saving and Development* 2 (3):85-94.
- Adams, D.W,(1980). Recent Performance of Rural Credit Market, In *Borrowers and Lenders: Rural Finance Markets and Institutions in development Countries*, J. Howell, 15-33. London. Overseas Development Institute (ODI).
- Adams, D.W. and A. A. P. Romero, (1981). Group Lending to the Rural Poor in the Dominican Republic: A stunted innovation. *Canadian Journal of Agricultural Economics* 29: 217-224.
- Adams, D.W., D.H. Graham and J.D. Von Pischke, (1984). *Undermining Rural Development with Cheap Credit*. Boulder, Co, USA. West view Press
- Adams, D.W and R.C Vogel, (1985) *Rural Finance Markets in Low- income Countries: Recent Controversies and Lessons*. *World Development* 14(4) 477-487
- Adams, D.W, and M. L. Canvesi de Sahonero, (1987). *Rotating Savings and Credit Association in Bolivia*. Columbus, Ohio. USA: Department of Agricultural Economics and Rural Sociology, the Ohio State University, Mimeo.
- Agricultural Central Bank annual reports,(ACB), (1972-2004). www.agribank-ly.
- Ajayi, S.I, (2001). What African Needs to Do to Benefit from Globalization, Finance and Development? *Quarterly Journal of the International Monetary Fund*, Vol.38, No 4.Washington D.C.
- Alain B, Steven E. Shreve and Dennis Wong, (2004). General Framework for Pricing Credit Risk; *Mathematical Finance*, Vol.14, (3): 317-350.
- Ani L. Katchova and Peter J.Barry, (2005). Credit Risk Models and Agricultural Lending. *American Journal of Agricultural Economic* 87 (1):194-205.
- Anjni K, (1997). Does Lack of Access to Formal Credit Constrain Agricultural Production? Evidence from the Land Tenancy Market in Rural India. *American Journal of Agricultural Economics* 79: 754-763.

- Argent N, (2000). Whither the Lender of Last Resort? The Rise and Fall of Public Farm Credit in Australia and New Zealand- Prospective form the Australasia Region. *Journal of Rural Studies* 16 (1):61-77.
- Assefa A, (2004). A Review of the Performance of Agricultural Finance in Ethiopia: Pre- and Post Perform Period. International Development Economics Associates. www.ideaswebsite.org
- Atul , M, (2001). Coordination Failure in the Rural Credit Markets. *Journal of Microfinance* 3(1):95-114.
- Avery, R.B, (1981). Estimating Credit Constraints by Switching Regression. In C.F Manski and D. MackFadden, *Structural Analysis of Discrete Data with Econometric Application*. Cambridge: MIT Press.
- Barham, B. L., S. Boucher, and M. R. Carter, (1996). Credit Constraints, Credit Unions, and Small-Scale Producers in Guatemala. *World Development* 24 (5):793-806.
- Bastelaer V., (2003). Does Social Capital Facilitate the Poor's Access to Credit- A review of Microfinance Literature. Social Capital Initiative Working Paper No 8. Washington DC, USA: The World Bank.
- Binswanger, H, (1987). The Role of Collateral in Credit Markets with Imperfect Information, *European Economic Review* 31 (4):887-899.
- Binswanger, H, (1995). The Impact of Formal Finance on the Rural Economy of India: *Journal of Development Studies*. 32(2):234-262.
- Binswanger, H and D. A. Sillers, (1983). Risk Aversion and Credit Constraints in Farmers' Decision-making: A reinterpretation. *Journal of Development Studies* 20 (1):5-21.
- Braverman, A. and J.L.Guasch, (1984). *Agricultural Policies-Agriculture and Rural Development*. World Bank, June 1989.
- Braverman, A, and J.L.Guasch, (1986). *Rural Credit Markets and Institutions in Developing Countries: Lessons for Policy Analysis form Practice and Modern Theory*. *World Development* 14 (10/11):1253-1267.
- Buchenrieder, G., and I. Theosfeld, (2001). Improving Bankability of Small Farmers' in Northern Vietnam. *Saving and Development* 24 (4): 385-403.
- Caroline E.Glackin, (2002). What does it Take Borrow? Framework for Analysis: *Journal of Microfinance* 4 (1):115-135.

- Chambers, R, (1983). *Rural Development: Putting the Last First*, London: Longmans.
- Charles G, (2007). *Estimating Credit Constraints Among US Households*. *Oxford Economic Papers* 59 (2007):583-605. Oxford University Press 2007.
- Charles G and Francis Vella., (2004). *Credit Supply and Demand Among US Households*. European University Institute.
- Deaton, A (1991). *Saving and Liquidity Constraints*. *Econometrica* 59:1221-1248.
- Deaton, A (1992). *Understanding Consumption*. Oxford-University Press.
- Diagne, A, (1997). *Determinants of Household Access to and Participation in Formal and Informal Credit Markets in Malawi*. International Food Policy Research Institute (IFPRI), Food Consumption and Nutrition Division (FCND) Washington D. C, USA.
- Diagne, A, Zeller, M (2001). *Access to Credit and its Impacts on Welfare in Malawi: (Research Report 116)*. Washington D.C: International Food Policy Research Institute (IFPRI).
- Diagne, A. Zeller, M and M, Sharma, (2000). *Empirical Measurements of Households Access to Credit and Credit Constraints in Developing Countries: Methodological Issues and Evidence*. Discussion Paper No 90/2000. Washington DC, USA: International Food Policy Research Institute (IFPRI). Food Consumption and Nutrition Division (FCND).
- Diagne, A, (1999). *Determinants of Households' Access to and Participation in Formal and Informal Credit Markets in Malawi*. Discussion Paper No 67/1999. Washington DC, USA: International Food and Policy Research Institute(IFPRI)- Food Consumption and Nutrition Division (FCND).
- Fabrizi, D., and Padula, (2003). *Does Poor Legal Enforcement Make Households Credit-Constrained?* FAME Research Paper No 81. Geneva, Switzerland, International Center for Financial Assets Management and Engineering (FAME).
- Fabrizi, R Chaddad, Michael L. Cook and Thomas Heckelevi, (2005). *Testing for the Presence of Financial Constraints in US Agricultural Cooperatives: An Investment Behavior Approach*. *Journal of Agricultural Economics* 56 (3): 385-397.
- FAO, *Food and Agricultural Indicators Country: Libyan Arab Jamahiriya*, July (2004). Food and Agricultural Organization of the United Nations. Internet [.www.fao.org](http://www.fao.org)
- Farmer, R (1997). *Macroeconomics*. Department of Economics UCLA.
- G.N Ssemogerere, (2004). *Agricultural Sector Credit and Structural Adjustment: Uganda's Poverty Reduction 1990-2000- 2003/04*; International Conference on the Agrarian

Constraint and Poverty Reduction, organized by: Ethiopian Economic Association (EEA) in Collaboration with the International Development Economics Associates (IDEAs) and Council for the development of Social Sciences Research in Africa.: Macro- economic Lesson for Africa 16th–19th December 2004.

Greene. W.H, (2000). *Econometric Analysis*, 4th edition,. London: Prentice Hall.

Guirkinger, C. Boucher, S and Carter, M (2005). *Risk Rationing and Wealth Effects in Credit Market*. Working Paper. Department of Agriculture and Resource Economics. University of California, Davis.

Gujarati, D (1995). *Basic Econometrics*, International Edition.

Hall, R, (1978). Stochastic Implications of the Life Cycle Permanent Income Hypothesis: Theory and Evidence. *Journal of Political Economy* 86 (5):971-987.

Hedhues, F, (1995). Rural Finance Markets –An Important Tool to Fight Poverty, *Quarterly Journal of International Agriculture* 34(2):105-108

Henk, A. J. Moll, (2006). *Microfinance and Rural Development, A long-Term Perspective*. *Journal of Microfinance* 7 (2):13-31.

Hollis, C and T.N. Srinivasan, (1989) *Handbook of Development Economics*, Volume (1),1989, 674-827

Hossain, M, (1988). *Credit for Alleviation of Rural Poverty: The Grameen Bank in Bangladesh*. Research Report No.65 Washington, DC., USA.: International Food Policy Research Institute (IFPRI).

Hulme, D, (1990). *Can the Grameen Bank be Replicated? Recent Experiments in Malaysia, Malawi, and Sri Lanka*. Development

Hulme, David and Mosley P, (1996). *Finance Against Poverty Volume 1*. Published by Routledge (International Thomson Publishing Company).

Hulme, D and Mosley P (1996). *Finance against Poverty Volume 2*. Published by Routledge (International Thomson Publishing Company).

IFAD, International Found for Agricultural Development, (1988). *Credit for Rural Poor: A review of IFAD's Experience. 1978-1987*. Rome Italy: International Fund for Agricultural Development (IFAD).

IMF, International Monetary Fund, (2003). *The Socialist People's Libyan Arab Jamahiriya; Country report No 03/327*. Washington, D, C. Internet: www.imf.org

- IMF, International Monetary Fund, (2004). The Socialist People's Libyan Arab Jamahiriya Article IV Consultation-Staff Report; Staff Statement; and Public Information Notes on Executive Board Discussion : IMF Country Report No 05/83. Washington, D, C. Internet: www.imf.org.
- IMF, International Monetary Fund, (2005). The Socialist People's Libyan Arab Jamahiriya; Statistical Appendix. IMF Country Report No 05/78. Washington, D, C. Internet: www.imf.org.
- IMF, International Monetary Fund, (2006). The Socialist People's Libyan Arab Jamahiriya: Article IV Consultation-Staff Report; Staff Statement; and Public Information Notes on Executive Board Discussion IMF Country Report No 06/136. Washington, D, C. Internet: www.imf.org.
- IMF, International Monetary Fund, (2006). The Socialist People's Libyan Arab Jamahiriya: Selected Issue-Medium-term Economic reform Strategy and Statistical Appendix. IMF Country Report No 06/137. Washington, D, C. Internet: www.imf.org.
- Jaffee and Stiglitz. (1990). Credit Rationing. In: B. Friedman and F. Hahn, Editors, Handbook of Monetary Economics, North Holland, Amsterdam, 1990.
- Jaffee, and Russel, (1976). Imperfect Information, Uncertainty, and Credit Rationing, Quarterly Journal of Economics 90,651-666
- James, Copestake, (2002). Unfinished Business: The Need for More Effective Microfinance Exit Monitoring, Journal of Microfinance 4 (2): 01-30
- Jarka, C. and Christian, B, (2002). Counting in Social Capital When Easing Agricultural Credit Constraints. Journal of Microfinance 4 (2):17-36
- Jbili, A., Enders, K and V. Treichel, (1997). Financial Sector Reforms in Algeria, Morocco, and Tunisia: A preliminary Assessment,. IMF Working Papers No WP/97/81. The International Monetary Fund. Washington D.C. Internet: www.imf.org
- Jappelli, T, (1990). Who is Credit Constrained in the US? Quarterly Journal of Economics, 219-234.
- Leather, D. Howard, (1990). Evidence on Credit Rationing and the Effects of Credit on Farm Output. American Journal of Agricultural Economics, August, 1990. 782-783
- Ledgerwood, J, (1999). Sustainable Banking with the Poor-Microfinance. Handbook- An Institutional and Financial Perspective, Washington DC, USA. World Bank.

- Levene, R and David Renelt, (1992). A sensitivity Analysis of Cross Country Growth Regression, *American Economic Review* 79 (September):942-963.
- Livingstone, I, (2000). Agriculture, Small Enterprise Development and Poverty Eradication in Vietnam. *Journal of the Asia Pacific Economy* 5 (3): 173-189.
- LCB, Libyan Central Bank, (1988-2005). Annual reports
- LMA, Libyan Ministry of Agricultural, (1998-2005). Annual reports.
- LMF, Libyan Ministry of Finance, (2000-2005). Annual reports.
- LMP, Libyan Ministry of Planning, (1970-2004), Annual reports.
- LMLT, Libyan Ministry of Labor Force and Training, (2001-2006) Annual reports.
- Maddala, G.S, (1983). *Limited Dependent and Qualitative Variables in Econometrics*. Cambridge. Cambridge University Press Handbook.
- Matin, I.,D. Hulme, and S. Rutherford, (1999). *Financial for the Poor and Poorest: Deepening Understanding to Improve Provision*. Finance and Development Research Program. Working Paper No 9. Manchester, UK: University of Manchester, Institute for Development and policy Management.
- Michael, R. Pakko (1999). Do high interest rates steam capital outflows? *Economics Letters* (67) (2000) 187-192.
- Montgomery, R, (1996). Disciplining or Protecting the Poor? Avoiding the Social Costs of Peer Pressure in Micro-Credit Schemes. *Journal of International Development* 8 (2):289-305.
- Mpuga, P (2004). Demand for Credit in Rural of Uganda: Who Cares for the Peasants; A Paper Presented at the Conference on Growth Poverty Reduction and Human Development in Africa- Center for Study of African Economics. March 21-22.
- Morduch, J, (1999). The Microfinance Promise. *Journal of Economic Literature* 37 December: 1569-1614.
- Mundlak, Y, (2000). *Agricultural and Economic Growth; Theory and Measurement*. Harvard University Press, Cambridge, Massachusetts, London, England, Handbook.
- Napoleon, B. (2000). Rural Towns as Partner in the Utilization of Finance Credit, A Viable Option for Accelerated Development in Africa, *Journal of Microfinance* 2 (1): 43-68.
- Nathan, O; Andrie Schoombee; and Servaas van der Berg, (2004). Credit Demand and Credit Rationing in the Informal Financial Sector in Uganda. *African Development and*

- Poverty Reduction: The Macro-Micro Linkage. 13-15 October 2004. Lord Charles Hotel, Somerset West, South Africa.
- Navajas, S., M. Schreiner, E. L.Meyer, and C. Gonzalez-Vega, (2000). Microcredit and the Poorest of the Poor: Theory and Evidence from Bolivia. *World Development* 28 (2):333-346.
- Nitin, Bhatt and Y.S.P. Thorat, (2001). India's Regional Rural Banks: Institutional Dimension of Reforms. *Journal of Microfinance* 3(1):65-94.
- OECD, Center for Co-operation with Non-members, (1999) Agricultural Finance and Credit Infrastructure in Transition Economies, Proceeding of OECD Expert Meeting, Moscow.
- Park, A., and C. Ren. (2001). Microfinance with Chinese Characteristics. *World Development Research* 29 (1):39-62.
- Petrick, Martin (2002). Farm Investment, Credit Rationing and Public Credit in Poland. Discussion Paper, No 43-2002. Institute of Agricultural Development Central and Eastern Europe, internet: www.iamo.de
- Petrick, Martin (2004). Credit Rationing of Polish Farm Households; A theoretical and Empirical Ananalysis. Institute of Agricultural Development in Central and Eastern Europe (IAMO). Volume 26.
- Petrick, Martin and Laure Latruffe, (2006). Contractual Relations in Agricultural Credit Markets: A Hedonic Pricing Approach with Application to Poland. *Journal of Agricultural Economics* 57 (1):49-63
- Ranjula, Ball Swain, (2002). Credit Rationing in Rural India. *Journal of Economic Development*, Vol.27, No.2 December 2002.
- Rashid, Shahidur; Sharam Manohar; Zeller, Manfred, (2002). Micro-lending for Small Farmers in Bangladesh: Does it Affect Farm Households Land Allocation Decision? (MTID) Discussion Paper (45). Washington DC: International Food Policy Research Institute (IFPRI).
- Rose, Peter (2005). Money and Capital Markets; Financial Institutions and Instruments in a Global Marketplace. Seventh Edition, Handbook.

- Rothschild Michael and J. Stiglitz, (1976). Equilibrium in Competitive Insurance Markets: An Essay on The Economics Imperfect Information. *Quarterly Journals of Economics*. (86):629-649.
- Ruerd Ruben and Luud Clercx; Rural Finance, Poverty Alleviation, and Sustainable Land Use; The Role of Credit for the Adoption of Agro-forestry System in Occidental Honduras. *Journal of Microfinance* 5 (2):77-100.
- Saad A. Alghariani, (1993). Satisfying Future Water Demands of Northern Libya.
- Salem, O.M, (1992). The Man Made River Projects. *Water Resources Development* 8 (4).
- Sam Afrane, (2002). Impact Assessment of Microfinance Interventions in Ghana and South Africa. *Journal of Microfinance* 4(1)37-58.
- Stiglitz, J. E, and Weiss A. 1981: Credit Rationing in Markets with Imperfect Information. *The American Economic Review* 71 (3): 393-410.
- Swan, R (2002). Credit Rationing in Rural in India, *Journal of Economic Development* 27 (2):1-22 December 2002.
- Thankom A; Hulme, D (2003). Balancing Supply and Demand: The Emerging Agenda for Microfinance Institutions. *Journal of Microfinance* 5 (2):1-5.
- Townsend, P.1995. *The International Analysis of Poverty*. Harvester Wheatsheaf. London.
- Varian H (2006), *Intermediate Microeconomic, A modern Approach* 7th edition
- Walsh. E. Carl, (2003). *Monetary Theory and Policy*.
- Williamson S. (1983). Costly Monitoring, Loan Contracts, and Equilibrium Credit Rationing. *The Quarterly Journal of Economics*, Vol 102, No (1), 135-145.
- Wooldridge, J. (2002) *Econometric analysis of cross section data and panel data*. Massachusetts of Technology.
- World Bank (1996-2008), *Country Data Report for Libya*. www.worldbank.org
- Yaron, J, (1991). *Successful Rural Finance Institution*, Vol 2, Washington D.C. World Bank, Agriculture Policy Division.
- Yaron, J, (1992). *Successful Rural Finance Institutions*. Discussion Paper 150. World Bank. Washington, D.C.
- Yaron, J, (1992). *Rural Finance in Developing Countries*. Working Paper at the World Bank.
- Zeller, M; Sharma, M (1988). *Rural Finance and Poverty Alleviation (Food Policy Research Report 8)* Washington DC; International Food Policy Research Institute (IFPRI).

- Zeller, M, (1995). The Demand for Financial Services by Rural Households-Conceptual Framework and empirical finding. *Quarterly Journal of International Agricultural* 34(2):149-170.
- Zeller, M, (1994). Determinants of Credit Rationing; A study of Informal Lenders and Formal Groups in Madagascar, *World Development* 22(12)1895-1907.
- Zeller, M; Gertrud, Shrieder ; Joachim von Braun; Franz Heidhues, (1997). Rural Finance for Food Security for the Poor; Implications for Research and Policy. (Food Policy Review 4). Washington D.C. International Food Policy Research Institute (IFPRI).
- Zeller, M; Sharma, Manohar; Ahmed, Akhter U; Rashid, Shahidur, (2001). Group-Based Financial Institutions for the Rural Poor in Bangladesh: An Institutional and Household-Level Analysis. (Research Report 120) Washington, DC: International Food Policy Reserch Institute (IFPRI).
- Zeller, M; Sharma, Mannohour; Henry, Carla; Lapenu, Cecile, (2001). An Operational Tool for Evaluating Poverty Outreach of Development Policies and Projects (IFPRI).

APPENDIX

LIST OF VARIABLES AND UNIT OF MEASUREMENTS

Depended variables	Unit Measurement
Access to credit	Yes or No
Applied for credit	Submit Application (Yes or No)
Amount of credit received	Measured in Libyan Dinars
Facing credit constraints	Special measurement (see chapter 9)
Explanatory Variables 1. (Location)	Unit of Measurement
Region	Code is used
Village	Name
Distance from nearest road	Km
Type of the main road	Code is used
Accessibility to the main road	Code is used
Distance from nearest markets	Km
Distance from nearest bank	km
Distance from nearest agricultural bank	Km
Distance from nearest agric- association	Km
Which Banks	Agric-Banks or Non-agric- Banks
Explanatory Variables 2. Household characteristics)	Unit of Measurement
Head of Household type	Code is used
Relationship to head of Household	Code is used
Age of Household	Years
Gender	Male or Female
Martial status	Cod is used
Formal education	Years in schools
Informal education	Yes or No
Main occupation	Code is used
Second occupation	Cod is used
Explanatory Variables 3 (Land productivity irrigation and soil fertility)	Unit of Measurement
Owning Farm	Yes or No
Farm size	Hectares
The proportion of cultivated land	Hectares
Land productivity since acquired	Code is used
Water sources in farm	Code is used
Actual and actual rainfall	MM per year
Type of soil	Code is used
Soil fertility	Code is used
Using fertilizer	Yes or No
Cost of fertilizer per kg	In Libyan Dinars
Source to the fertilizers	Code is used
Explanatory Variables 4. Major items of Farm production	Unit of Measurement
Type of crop	Unit per hectares
Total quantity	Per unit
Price per unit	LYD
Livestock holding	Yes or No

Type of livestock	Name		
Highest livestock owned	Numbers		
Number sold in past three years	Numbers		
Amount paid for feeds last year	LYD		
Distance from nearest water source in dry summer	Km		
Explanatory Variables 5 HH assets	Unit of Measurement	Owned year	Value
Cars	Number		LYD
Tractors	Number		LYD
Other Agricultural Machinery (write)....	Number		LYD
Any other assets (write).....	Number		LYD
Type of house owned	Using code		LYD
Explanatory Variables 6 Credit Applications	Unit of Measurement		
If not Applied for credit (why)	Code is used		
Successful application	Yes or No		
If not successful (why)	Code is used		
Which year HH got the credit	Year		
Purpose of the credit (write)	Code is used		
Amount applied for	LYD		
Amount of credit received	LYD		
Have the credit in time	Yes or No		
The credit was enough or not	Yes or No		
If not How much amount of credit need to finish the purpose	LYD		
Type of payment	Code is used		
Type of collateral required	Code is used		
Interest rate	%		
How made the decision to take loan	Code is used		
Explanatory Variables 7 Credit Used	Unit of Measurement		
How did HH used the loan	Code is used		
How did the loan influence your work	Code is used		
Explanatory Variables 8 HH Socio-Economic characteristics	Unit of Measurement		
What type of self-employment activities HH engaged	Code is used		
Other HH income	Code is used		
HH have permanent income	Code is used		
Estimated average income of HH	LYD		
Explanatory Variables 9 Rural Housing	Unit of Measurement		
What material is used for the floor of the main house	Code is used		
What material is used for roof of the main house	Code is used		
What material is used for outer wall	Code is used		
What material is used for windows	Code is used		

RURAL HOUSEHOLD SURVEY

Date/...../.....	Region Name	Number (..)
------------------------	-------------------	-------------

Rural finance, access to the credit, credit constraint, and quantity of credit received among households, household characteristics and the role of agricultural banks and non agricultural banks in credit market.

NOTES FOR ENUMERATORS

1. Try to **EXPRESS** that this questionnaire will help households to have better financial services and ease to access to credit this might you to response from households and us to as accurate information as possible
2. Please make sure that you **READ** and you **UNDERSTAND** the question before you start the interview with household.
3. This questionnaire **MUST** be administered to a household or in the most adult member of the family they own or living in the house (above 18 years old) .If all these are not available, go for the alternative provided.
4. Please make sure that hand in all **COMPLETED** questionnaires before ending the interviews.
5. Please record all the responses within the interview time and give a few minutes at the end of the interview to cross-check the responses you have not clearly understood/recorded.

Name of Enumerator	Tel.....	E-mail.....
--------------------------	----------	-------------

1. Regional Characteristics

1.1 Region-Code.....

Misratah=1, Surt=2, Waddan=3

1.2 Sub-Regional Name: (write).....

1.3 Village name.....

1.4 Distance from nearest market (km).....

1.5 Distance from nearest main road (km).....

1.6 Type of the main road.....

Bitumen= 1, Gravel=2, Earth =3, Other specify= 4

1.7 Accessibility to the main road in the rainy season.....

Easily =1, Fairly=2, Difficult=3

1.8 Distance from the nearest bank in (km).....

1.9 Distance from the nearest agricultural association in (km).....

1.10 Distance form the nearest agricultural bank in (km).....

2. Household Characteristics

2.1 Household code..... (use code A).....

2.2 Relation to the household head..... (use code A).....

2.3 Age of household..... (Years).....

2.4 Head of household Gender's.....

1 = male

0 = female

2.5 Martial status.....

1 = single, 2 = married, 3 = widower, 4 = divorce

2.6 Formal education.....

1 = None 4 = Secondary school
 2 = Primary school 5 = Institute
 3 = Preparatory school 6 = Higher Institute or University,
 7 = Other (write).....

2.7 Informal education.....

1 = None 3 = Artisan training
 2 = Farm training 4 = Other (write)

2.8 Main occupation (use the code).....

2.9 Second occupation (use the code).....

Cod A.

Relationships	Occupations	
01. Head	00. None	11. Military/Police
02. Husband	01. Farming	12. Petty trade
03. Wife	02. Teaching	13. Other paid employment
04. Son	03. Artisan	14. Other (write).....
05. Daughter	04. Civil servant	
06. Mother	05. Trader/shopkeeper	
07. Brother	06. Agric-labor	
08. Sister	07. Student	
09. Other relatives.....	08. House-worker	
10. Other non-relative.....	09-Retired	
11. Other (write).....	10. Unemployment	
Education	Gender	
01. None	1. Male	
02. Primary School	0. Female	
03. Preparatory School		
04. Secondary School		
05. Institute		
06. University or Higher		

2.10 Please fill for all members of households living in the same house.

Rural Family who live in the same house only.	Age (Years)	Gender (M or F)	Education (Years in schools)	Occupation use Cod A.
Husband				
Wife				
Son				
Daughter				
Mother				
Brother				
Sister				
Other relatives				
Other relatives.				
Other relatives.				
Other relatives.				
Other relatives.				
Other relatives.				
Other relatives.				

3. Land productivity, water sources and soil fertility

3.1 Did you have a Land or Farm? Yes =1, No=2

If **No** don't Fill the questions next questions (3.2, 3.3 and 3.4)

3.2 If **Yes**, How large is the land or the farm size? (in hectares)

3.3 What proportion of the land is cultivated? (In hectares)

3.4 What has been the condition of the land productivity since it was acquired? ..

1= decreasing, 2= increasing 3= the same

If decreasing, what are the possible reasons? (Write here)

.....

If increasing, what are possible reasons? (Write here).....

.....

If the same productivity, what are possible reasons? (Write here)

.....

3.5 What types of water sources did you depends on in your land?

- 1. Rain
- 2. Ground water in the farm
- 3. Ground water provided by government
- 4. Water provided by Made River
- 5. Water Collected from rain
- 6. Other (write).....

3.6 Rainfall requires the actual rainfall for the calendar year and the average rainfall for your region indicate the type of season on the scale below.

Actual mm.....
Average mm.....
1 = less than average
2 = above average.....

3.7 Type of soil ;(please chooses one type).

- 1. Mostly sand
- 2. Sand-clay
- 3. Clay
- 4. Rocky
- 5. Other (write).....

3.8 Soil fertility (Please choose one type)

- 1= Poor
- 2= Fair
- 3= Good
- 4= Very good

3.9 Did you use any Fertilizer?

- 1= Yes, 2=No

3.10 If Yes how many KG /hectare used during the year?

3.11 How much cost per KG in Libyan Dinar?

3.12 From where you can buy fertilizer?

- 1= from the markets, 2= Agricultural Association, 3= Other (write).....

4. Household assets

Household assets	Number	Year owned	Value in LYD
Tractors			
Agricultural Machinery			
Cars			
Houses			
Land.....			
Other (write).....			
Other (write).....			
Other (write).....			
Other (write).....			
Other (write).....			
Other (write).....			

5. Agricultural Production major items

5.1 What types of crops did you produce in your farm last year or season? Fill the table below:

Type of crop	Unit/hectare	Total quantity	Price LYD/Unit	Profit(+) or Loss (-)
				()
				()
				()
				()
				()
				()
				()
				()
				()
				()
				()
				()
				()

6. Information on livestock holdings

6.1 What type of Livestock did you holding in your farm? Please fill in the table.

	Cattle	Sheep	Camels	Poultry	Other...	Other... ..	Other.....
Total number present							
Highest number over owned at one time							
Year of highest no owned							
Number sold in past three years							
Feeding costs in Last three years in LYD							
Distance to the nearest water sources in the dray seasons							

7. Credits

7.1 Do you have access to credit facilities?

1= Yes, 2= No

7.2 Have you ever or any members of your household applied for loan from any source in the last 10 years?

1 = Yes, 2= No

If Yes (go to question 7.4) If No (than go to next question 7.3)

7.3 Why you did not applied for loan? Please choose one.

1. Because you don't need loan
2. Because the interest rate is high
3. Because the interest rate is prohibited
4. Because you didn't meet requirement
5. Because of Other reason (write.....)

7.4 Is your application successful?

1= Yes, 2=No

If Yes than (go to question 7.6), If No (than answer next question 7.5)

7.5 If not successful. Why?

1. Don't meet requirement,
2. Fund exhausted
3. Late of application
4. Other (write.....)

7.6 If application successful, then fill the next table (if you have one or more than one applications successful pleas fill under the number of loans during last 10 years.

	Loan. No.1	Loan No.2	Loan. No.3	Loan. No.4
Year				
Loan purpose (use cod B)				
Type of lender (used cod B)				
Amount applied for in LYD				
Amount you received in LYD				
Given to you in time 1=Yes,2=No				
Is the loan was enough to do purpose 1 = Yes 2 =No				
If amount of credit not-enough How much you need? In LYD				
Type of credit payment (1=cash, 2= kind, 3 =mixed)				
Repayment period in (months)				
Interest rate (%)				
Type of collateral required (use cod B)				

Cod B.

Loan purpose	Type of lender	Type of collateral required
1. Farm inputs	1. Agricultural banks	1. None
2. Feeding animal	2. Other banks (write.....)	2. Land
3. Buying land	3. Relatives	3. Land title
4. Building a house	4. Work place in government	4. Animal
5. Education	5. Mutual assistance from neighbors	5. Co-signature
6. Buying machinery	6. Co-operative	6. Group guarantee
7. Food and Cloths	7.Other (write.....)	7.Other (write.....)
8. Other (write.....)		

7.7 How made the decision bout taken a loan?

- 1. I decided it myself, without any advisors
- 2. I co-decided together with my family members
- 3. I co-decided together with a person from anther than family
- 4. Another person took a decision about it
- 5. Other (write).....

7.8. How did you use your loan? *Up to three possible answer*

- 1. Inputs (seed, fertilizer). |....|
- 2. Land cultivation, taxes, irrigation, etc. |....|
- 3. Harvesting (preparation to harvest, manpower, and gathering marketing |....|
- 4. Animal breeding. |....|
- 5. Equipment purchase |....|
- 6. Financing non-agri-business. |....|
- 7. Family expenses |....|
- 8. Education expenses (clothes, food...etc). |....|
- 9. Building house |....|
- 10. Other (write.....) |....|

7.9 How did the loan influence you work? *Only one possible answer.*

- 1. Helped me to start up the business
- 2. Help me to expand the business
- 3. Caused no change in business
- 4. Decreased my business scope
- 5. Promoted me to stop the business
- 6. Other influence (write).....

8. socio-economic background of households

8.1 Please identify up to 3 of the most important self employment activities that have generated for your family cash or good for exchange in the last 12 months.

- | | |
|-----------------------------------|------------------------------------|
| 1. Sheep rising..... [..] | 9. Potato culture..... [..] |
| 2. Cattle raising..... [..] | 10. Vegetable production..... [..] |
| 3. Camel raising [..] | 11. Olive production..... [..] |
| 4. Poultry keeping [..] | 12. Dates production..... [..] |
| 5. Wheat culture..... [..] | 13. Apple production..... [..] |
| 6. Barley culture [..] | 14. Orange production.....[..] |
| 7. Groundnut production..... [..] | 15. Lemons.....[..] |
| 8. Other (write.....)..... [..] | 16. Other (write).....[..] |

8.2 What are your other income sources for your family?

1. Wages (government job) [..]
2. Private sector (non- agri-income) [..]
3. Pension..... [..]
4. Social welfare)..... [..]
5. Other (write.....).....[..]

8.3 How many member of household have permanent income from off-farm activities? Please write the number.

1. Wages (government job)[..]
2. Private sector (non- agri-income)[..]
3. Pension.....[..]
4. Social welfare.....[..]
5. Other (write).....[..]

8.4 What is the estimated average annual total household income in LYD ?

- | | |
|-------------------|---------------------|
| 1. Less than 1000 | 7. 6001-7000 |
| 2. 1001-2000 | 8. 7001-8000 |
| 3. 2001-3000 | 9.8001-9000 |
| 4. 3001-4000 | 10.9001-10000 |
| 5. 4001-5000 | 11. More than 10000 |

9. Household's Residence

9.1 What material is use for the floor of the main house?.....

1. *Earth*
2. *Concrete.*
3. *Timber.*

9.2 What material is use for the roof of the main house? ?.....

1. *Timber*
2. *Metal/iron sheet*
3. *Tiles*
4. *Other (write).....*

9.3 What material used for the outer walls of the main house?

1. *mud/ poles*
2. *Cement*
3. *Timber*
4. *Other (write).....*

9.4 What material used for the windows of the main house?

1. *Wood*
2. *Glass*
3. *Metal*
4. *Others (write).....*

This is the end of our interview

Thank you very much for your time and information

